

A-E Construction Specifications

PROJECT FILE NO. 020996

STAGING, STORAGE, SIZING AND TREATMENT FACILITY

Prepared for:
U.S. Department of Energy
Idaho Operations Office
Idaho Falls, Idaho



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Rev. 03

**SPECIFICATIONS
FOR
STAGING, STORAGE, SIZING AND TREATMENT FACILITY**

Prepared for:

**U. S. DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE**

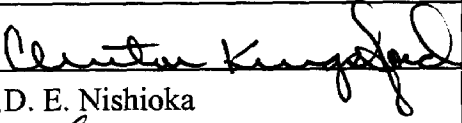
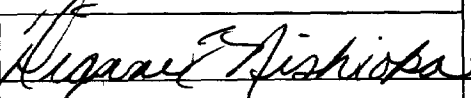
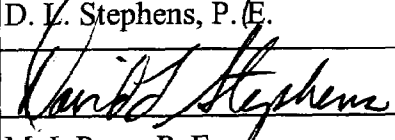
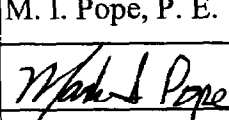
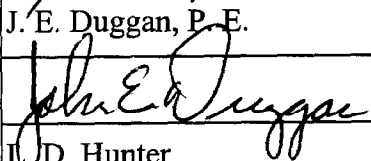
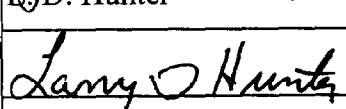
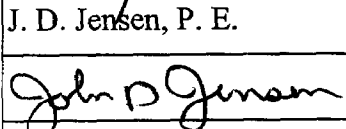
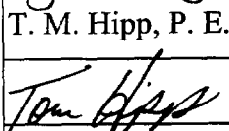
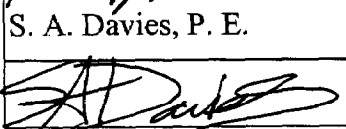
Idaho Falls, Idaho

Project File No. 020996

March 2002

**BECHTEL BWXT IDAHO, LLC (BBWI)
Idaho Falls, Idaho 83415**

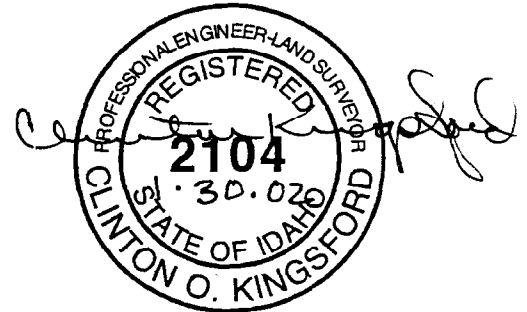
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**STAGING, STORAGE, SIZING AND TREATMENT FACILITY
Phase 1**

The following Sections of this Specification were prepared under the direction of the Professional Engineer as indicated by the seal and signature provided on this page. The Professional Engineer is registered in the State of Idaho to practice Civil Engineering.



Division 1 -- General Requirements

- 01005 -- Summary of Work
- 01051 -- Construction Surveying and Staking
- 01300 -- Submittals

Division 2 -- Site Work

- 02200 -- Earthwork
- 02430 -- Culverts
- 02452 -- Signage
- 02486 -- Revegetation
- 02513 -- Asphalt Concrete Paving
- 02598 -- Secondary Contaminant Liner System
- 02713 -- Underground Potable and Raw Water System
- 02722 -- Sanitary Sewer System
- 02732 -- Decontamination Water Piping and Pumping System
- 02733 -- Pressure Testing of HDPE Piping

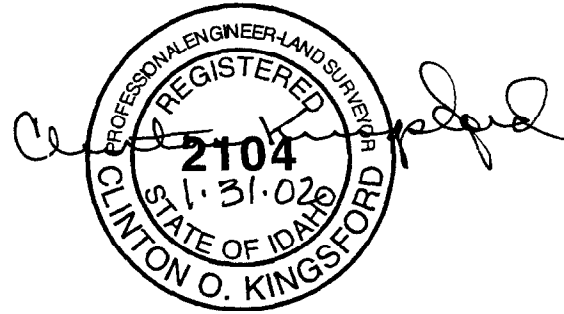
Division 3 -- Concrete

- 03400 -- Precast Concrete

STAGING, STORAGE, SIZING AND TREATMENT FACILITY

Phase 1

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Division 4 -- Masonry

04220 -- Concrete Masonry Units

Division 7 -- Thermal and Moisture Protection

07190 -- Vapor Barriers
07200 -- Thermal Insulation
07901 -- Joint Sealants

Division 8 -- Doors and Windows

08110 -- Steel Doors and Frames
08362 -- Insulated Sectional Overhead Door
08700 -- Door Hardware

Division 9 -- Finishes

09250 -- Gypsum Drywall
09510 -- Acoustical Ceilings
09900 -- Painting

Division 10 -- Specialties

10160 -- Toilet Partitions
10260 -- Corner Guards
10440 -- Letters
10500 -- Metal Lockers
10800 -- Toilet Accessories

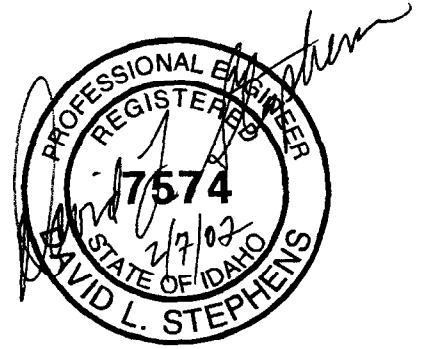
Division 12 -- Furnishings

12390 -- Cabinets and Plastic Laminate
12670 -- Entrance Mats

STAGING, STORAGE, SIZING AND TREATMENT FACILITY

Phase 1

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Division 3 -- Concrete

- 03300 -- Cast In Place Concrete
- 03365 -- Post Tensioned Concrete
- 03410 -- Precast/Prestressed Concrete

Division 13 -- Special Facilities

- 13120 -- Metal Building Systems
- 13200 -- Truck Scale

**STAGING, STORAGE, SIZING AND TREATMENT FACILITY
Phase 1**

The following Sections of this Specification were prepared under the direction of the Professional Engineer as indicated by the seal and signature provided on this page. The Professional Engineer is registered in the State of Idaho to practice Mechanical Engineering.

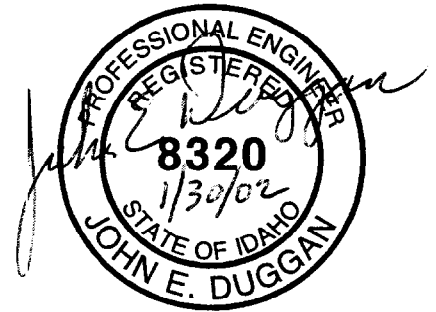


Division 15 -- Mechanical

- 15401 -- Plumbing Systems
- 15480 -- Sterilization of Water Piping
- 15800 -- Heating and Cooling
- 15801 -- Air Distribution System
- 15883 -- HEPA Filter Housings

STAGING, STORAGE, SIZING AND TREATMENT FACILITY Phase 1

The following Sections of this Specification were prepared under the direction of the Professional Engineer as indicated by the seal and signature provided on this page. The Professional Engineer is registered in the State of Idaho to practice Electrical Engineering.

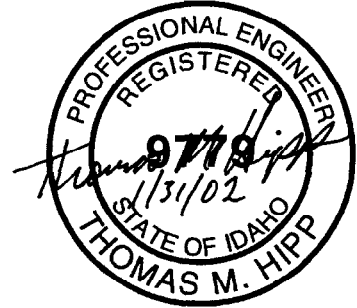


Division 16 -- Electrical

- 16000 -- Electrical General Provisions
- 16109 -- Switches, Receptacles and Wall Plates
- 16110 -- Electrical Raceways
- 16120 -- Cable, Wire, Connectors and Miscellaneous Devices
- 16124 -- Insulated Medium Voltage Cable and Connectors
- 16160 -- Panelboards
- 16195 -- Electrical Identification
- 16360 -- Disconnect Switches 600 V and Less
- 16414 -- Medium and High Voltage Pole Hardware and Equipment
- 16450 -- Grounding
- 16462 -- Transformers, Oil Filled, Pad Mounted, Power
- 16500 -- Lighting

**STAGING, STORAGE, SIZING AND TREATMENT FACILITY
Phase 1**

The following Sections of this Specification were prepared under the direction of the Professional Engineer as indicated by the seal and signature provided on this page. The Professional Engineer is registered in the State of Idaho to practice Electrical Engineering.



Division 16 -- Electrical

16123 -- Fiber Optic Cable Installation
16610 -- Telephone System
16650 -- Instrumentation General Provisions

**STAGING, STORAGE, SIZING AND TREATMENT FACILITY
Phase 1**

The following Sections of this Specification were prepared under the direction of the Professional Engineer as indicated by the seal and signature provided on this page. The Professional Engineer is registered in the State of Idaho to practice Fire Protection Engineering



Division 13 -- Special Facilities

13505 -- Underground Fire Protection Piping
13911 -- Dry Pipe Fire Protection System

Division 16 -- Electrical

16721 -- Fire Alarm (FA) System

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16160 PANELBOARDS	5
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16650 INSTRUMENTATION GENERAL PROVISIONS	7
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Project Title: Staging, Storage, Sizing and Treatment Facility
Document Type: Construction Specifications Project Number: 020996
SPC Number: 1485

SECTION 01005--SUMMARY OF WORK

PART 1--GENERAL

SUMMARY:

The Subcontractor shall furnish plant, labor, material, equipment, and supplies (except Government-furnished materials and equipment) and perform work and operations necessary to construct the Staging, Storage, Sizing and Treatment components of the ICDF Complex complete, in accordance with the subcontract drawings and these specifications.

Work includes, but is not limited to:

Grading, leveling, excavation, and other earthwork. Construction of reinforced concrete slabs and foundations. Installation of building utilities (interior and exterior). Fabrication/Erection of metal building system. Construction/Installation of interior building features. Associated mechanical, piping, and electrical work.

Contractor's Note: The work on this project is in an Area of Contamination (AOC). All work shall be done in compliance with CFR 1910.120.

REFERENCES:

The following documents, including others referenced therein, form part of this Section to the extent designated herein.

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910 OSHA Occupational Safety and Health Standards
29 CFR 1926 OSHA Health and Safety Standards for Construction

BECHTEL BWXT IDAHO, LLC (BBWI)

Subcontractor Requirements Manual

Unless otherwise specified, references in these specifications or on the subcontract drawings to other specifications, codes, standards or manuals which are part of these specifications, but not included herein, shall be the latest edition, including any amendments and revisions, in effect as of the date of this Specification.

In the event of any inconsistency between codes, standards and this specification, the inconsistency shall be resolved by giving precedence as follows: (a) codes, (b) standards and (c) specification. The Subcontractor shall refer any conflicts promptly in writing to the Contractor using the Subcontractor Field Problem form.

Project Title: Staging, Storage, Sizing and Treatment Facility
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1 SUBMITTALS:

2
3 See Section 01300, Submittals and the Vendor Data Schedule for additional submittal
4 requirements.

5
6 QUALITY ASSURANCE:

7
8 Quality Assurance Program requirements shall exist to assure that work performed is in
9 conformance with the requirements established by the drawings and this specification. QA
10 Program criteria applicable to this scope of work is addressed in SC-5 of the Special
11 Conditions and these specifications.

12
13 Standard Products: The materials and equipment furnished by the Subcontractor shall be
14 standard products of manufacturers regularly engaged in the production of the type of
15 materials and equipment required and shall be of the manufacturer's latest standard designs.

16
17 Where two or more units of the same type and class of material or equipment are required,
18 the units shall be the product of the same manufacturer, and shall be identical insofar as
19 possible. The component parts of a unit of equipment need not be the products of the
20 manufacturer.

21
22 Repair of Damages: Construction materials and equipment, flange facings, threads,
23 machined or painted, and other exposed finished surfaces shall be protected from damage at
24 all times during shipping, handling, construction and installation. Materials and equipment
25 repaired or replaced by the Subcontractor shall be subject to acceptance by the Contractor.

26
27 SAFETY, HEALTH AND ENVIRONMENT:

28
29 In general, work shall be in compliance with the applicable sections of 29 CFR 1910, 29 CFR
30 1926 and the BBWI Subcontractor Requirements Manual.

31
32 DELIVERY STORAGE AND HANDLING

33
34 All materials normally packaged shall be delivered to the site in the original, unopened
35 packages with labels intact. Upon arrival, the Subcontractor shall inspect the materials or
36 equipment for damage.

37
38 Materials and equipment shall be stored and handled in accordance with the manufacturer's
39 instructions.

Project Title: Staging, Storage, Sizing and Treatment Facility
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1 PART 2--PRODUCTS

2
3 MATERIALS:

4
5 New Materials and Equipment: Materials and equipment received by the Subcontractor in a
6 damaged condition shall be repaired or replaced by the Subcontractor as directed by the
7 Contractor. Materials and equipment damaged by the Subcontractor shall be repaired or
8 replaced by the Subcontractor.

9
10 Hazardous Chemicals and Substances: The Subcontractor shall comply with applicable
11 requirements of 29 CFR 1926.59, Hazard Communication Standard.

12
13 PART 3--CONSTRUCTION AND INSTALLATION

14
15 General: Materials and equipment shall be erected or installed only by qualified personnel
16 who are regularly engaged in the trades required to complete the work. The subcontract
17 drawings show the general arrangement and space allocation of the equipment specified. It
18 shall be the Subcontractor's responsibility to verify changes in conditions or rearrangements
19 necessary because of substitutions for specified materials or equipment. Where
20 rearrangements are necessary the Subcontractor shall, before construction or installation,
21 prepare and submit drawings of the proposed rearrangement for approval.

22
23 Coordination of Work: Where new work and existing facilities are shown on the drawings,
24 but are not located precisely by dimensions, the Subcontractor shall be responsible for proper
25 location and clearances and for correcting discrepancies and interferences in the work which
26 are a result of his operations. Work done by one trade that must be integrated with work of
27 other trades shall be laid out with due regard to the work done, or to be done, by other trades;
28 particularly if the work done by one trade depends upon completion or proper installation of
29 work done by other trades. The Subcontractor shall cooperate in coordinating his work with
30 work being done by others if their work must be integrated with the Subcontractor's work.
31 The Subcontractor shall notify the Contractor at least one week prior to starting of the date on
32 which the Subcontractor proposes to proceed with the work.

33
34 Workmanship: Work shall be done in a skillful and workmanlike manner. The
35 Subcontractor shall do structural cutting, fitting, patching, repairing and associated work
36 necessary for installation of equipment, piping and electrical conduits, etc. No major cuts or
37 holes, not shown on the drawings, shall be made without prior approval of the Contractor.
38 After the equipment and/or piping is installed, exposed holes, cracks and other defects shall
39 be neatly patched and the patched areas shall match the adjoining materials and finish.

40
41 END OF SECTION 01005

Project Title: Staging, Storage, Sizing and Treatment Facility
Document Type: Construction Specifications **Project Number:** 020996
SPC Number: 1485

1 SECTION 01051--CONSTRUCTION SURVEYING AND STAKING

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 Work includes, but is not limited to:

8
9 Establish vertical control, slope staking, set grade-finishing stakes, building and
10 structure control, and liner controls.

11
12 SUBMITTALS:

13
14 Submittals include but are not limited to the following:

15
16 Certification: Submit certification that the land surveyor is a registered professional in the
17 State of Idaho.

18
19 See Section 01300, Submittals and Vendor Data Schedule for additional requirements.

20
21 QUALITY CONTROL:

22
23 Qualifications: Construction surveying and staking shall be accomplished under the
24 direction of a registered professional land surveyor in the State of Idaho.

25
26 PART 2--PRODUCTS

27
28 Stakes: Identification stakes and hubs shall be of sufficient length, width and depth to
29 provide a solid set in the ground and to provide space for marking above ground when
30 applicable. The top 2-in. of all slope, guard, reference, clearing, and structure stakes shall be
31 painted or marked with plastic flagging.

32
33 PART 3--EXECUTION

34
35 SURVEY REQUIREMENT:

36
37 Precision: Precision and accuracy requirements are contained in Table 1. The following
38 precisions shall be used:

39
40 Slope Staking Precision B
41 Finish Staking, Subbase Course - Precision B
42 Finish Staking, Base Course - Precision A

43
44 Control: Existing control monuments are shown on the drawings.

Project Title: Staging, Storage, Sizing and Treatment Facility
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1 Slope Stakes, Clearing Limits and Reference Stakes: Slope catch-points, clearing limits, and
2 slope reference stakes shall be established. The position of these stakes shall be determined
3 by methods that will produce on the ground the precisions shown in the Table 1.

4
5 Clearing limits shall be set within the tolerance shown in the Table 1. The clearing limit
6 shall be located on the ground and marked with lath, flagging, or other methods approved by
7 the Contractor's Representative.

8
9 The elevation and location of slope reference stakes shall be verified for accuracy by a
10 differential level run over the reference stakes between benchmarks.

11
12 Monuments of Property Boundaries or Surveys of Other Agencies: If property boundary or
13 survey monuments, or survey markers of other agencies, are found within or adjacent to the
14 construction limits, the Subcontractor shall immediately notify the Contractor's
15 Representative. These monuments shall not be disturbed.

16
17 Grade Finishing Stakes: Finishing stakes are required on the subbase and the crushed base
18 course. Stakes shall be set on a 50-ft grid and at the shoulders. Subgrade finishing stakes
19 shall be red tops and base course finishing stakes shall be blue tops.

20
21 Finishing stakes shall be set when subbase is within 0.2 ft, or base course is within 0.1 ft of
22 final grade. The stakes shall be set to the nearest 0.01 ft of the measured grade line.

1

TABLE 1. CROSS SECTION AND SLOPE-STAKE PRECISION

Item	Precision		
	A	B	C
Cross section topography measurements shall be taken so that variations in ground from a straight line connecting the cross section points will not exceed:	0.5 ft	1.0 ft	2.0 ft
Horizontal and vertical accuracy for cross-sections. In feet or percentage of horizontal distance measured from transverse line, whichever is greater.	.05 ft or 0.2%	0.15 ft or 0.6%	0.2 ft or 1.0%
Horizontal and vertical accuracy for slope stake, slope stake references, and clearing limits. In feet or percentage of horizontal distance measured from centerline or reference stake, whichever is greater.			
a. Slope reference stakes and slope stakes.			
b. Clearing limits.	0.1 ft or 0.4%	0.15 ft or 0.6%	0.2 ft or 1.0%
	1.0 ft	1.0 ft	1.0 ft

2

3 FIELD QUALITY CONTROL:

4

5 Surveillance will be performed by the Contractor's Representative to verify compliance of
6 the work to the drawings and specifications.

7

8 END OF SECTION 01051

1 SECTION 01300--SUBMITTALS

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 This section specifies the administrative, technical and quality requirements for Vendor Data
8 submittals. Vendor Data requirements are specified in individual specification sections or on
9 the drawings, and tabularized on a Vendor Data Schedule. In the event of conflicting
10 requirements, the submittal requirements prescribed in the individual specification section
11 shall prevail.

12
13 The Subcontractor shall submit data, drawings, and other submittals specified. If the
14 Contractor determines the Subcontractor's submittal to be incomplete or unacceptable, the
15 Subcontractor shall make a complete and acceptable submittal to the Contractor by the
16 second submission of a submittal item.

17
18 The Subcontractor shall be responsible for advising the Contractor of any submittal that may
19 be delayed and which might, if further delayed, extend completion of the project.

20
21 Section Includes, but is not limited to: The preparation, transmittal and delivery of
22 documents by the Subcontractor to the Contractor as required in the "Submittals" subdivision
23 of the specification sections and as provided on the Vendor Data Schedule.

24
25 Related Sections: General Provisions, Subcontractor Requirements Manual, Special
26 Conditions, Drawings, Vendor Data Schedule, and other sections of these specifications
27 apply to this section.

28
29 REFERENCES:

30
31 The following documents, including others referenced therein, form part of this Section to
32 the extent designated herein:

33
34 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

35
36 ANSI Y14.1 Drawing Sheet Size and Format

37
38 SUBMITTALS:

39
40 General Procedures: Vendor data, whether prepared by the Subcontractor or Subcontractor's
41 subtier or supplier, shall be submitted as instruments of the Subcontractor. Therefore, prior
42 to submittal, the Subcontractor shall ascertain that material and equipment covered by the
43 submittal and the contents of the submittal itself, meet all the requirements of the subcontract
44 specifications, drawings, or other contract documents.

45
46 Each submittal shall contain identification for each separable and separate piece of material

1 or equipment, and literature with respect to the information provided in the specification and
2 on the Vendor Data Schedule. Submittals shall be numbered consecutively for each different
3 submittal.

4
5 Vendor Data Schedule: Vendor Data required by the specification sections or the drawings to
6 support design, construction, and operation of the project is identified on a Vendor Data
7 Schedule. The Vendor Data Schedule provides a tabular listing by item number, drawing or
8 specification reference, and description of the item or service. The type of submittal is
9 identified by a "Vendor Data Code", and the time required to submit the item is identified by
10 a "When to Submit" code. An "Approval" code specifies whether the submittal is for
11 Mandatory Approval or for Information Only. One copy of routine paper or electronic file
12 submittals are required; additional copies may be required by the Vendor Data Schedule.
13 Electronic file submittals are preferred. Submittals that cannot be scanned or provided
14 electronically, such as material samples, will require 6 copies for Mandatory Approval and 4
15 copies for Information Only.

16
17 Or Equal Material or Equipment Submittals: All "or equal" materials, equipment or systems
18 shall be identified and submitted for approval as required by the Subcontractor Requirements
19 Manual.

20
21 An "or equal" submittal shall contain as a minimum all operating and physical parameters
22 necessary to show that the material or equipment is equivalent to the specified material or
23 equipment. All parameters shall be specifically identified by the submitter in the proposal.
24 Exceptions or differences between the specified item and the "or equal" item shall also be
25 identified.

26
27 If an "or equal" material, equipment or system is approved, the Subcontractor shall be
28 responsible for backup material necessary to include the material, equipment or system in the
29 technical documents. In most cases this includes "red lining" a set of design drawings, and
30 specifications to provide an "Approved for Construction" set of specifications and design
31 drawings which incorporate the changes caused by the "or equal" item. These "red line"
32 drawings shall be submitted prior to use of the "or equal" item. Any calculations or other
33 backup material necessary to show that changes are adequate shall be included with the "red
34 line" drawings and specifications.

35
36 Construction Vendor Data Transmittal and Disposition Form: All vendor data shall be
37 submitted to the Contractor using the Construction Vendor Data Transmittal and Disposition
38 Form. The form provides the Subcontractor a convenient method to submit vendor data and
39 provides the Contractor a means of dispositioning the submittal. The Subcontractor shall list
40 the Vendor Data Schedule item number, a Vendor Data Transmittal tracking number (if
41 applicable), the drawing or specification number reference, a Tag Number (if applicable), the
42 submittal status (e.g., Mandatory Approval, Information Only, Re-submittal, or Or-equal),
43 the Revision Level, and the item Description. The description should include the heat or lot
44 number for items requiring Certified Mill Test Reports.

45
46 Disposition by the Contractor: The Contractor's comments and required action by the

Subcontractor will be indicated by a disposition code on the submittal. The disposition codes will be classed as follows:

(A) "Work May Proceed." Submittals so noted will generally be classed as data that appears to be satisfactory without corrections.

(B) "Work May Proceed with Comments Incorporated. Revise Affected Sections and Resubmit." This category will cover data that, with the correction of comments noted or marked on the submittal, appear to be satisfactory and require no further review by the Contractor prior to construction. Revised drawings shall be provided upon request.

(C) "Work May NOT Proceed. Revise and Resubmit." Submittals so dispositioned will require a corrected resubmittal for one of the following reasons:

- 1) Submittal requires corrections, per comments, prior to final review.
- 2) Submittal data incomplete and requires more detailed information prior to final review.
- 3) Submittal data does not meet Subcontract document requirements.

(D) "Accepted for Use. Information Only Submittal." Submittals so dispositioned will generally be classified as Information Only for as-specified material and equipment.

Mandatory Approval coded vendor data will be reviewed by the Contractor and receive an A, B, or C disposition. Information Only submittals without comments will receive a D disposition. A, B, and C coded dispositioned submittals will be returned to the Subcontractor. D dispositioned submittals will not be returned to the Subcontractor. The Contractor may provide internal review of Information Only submittals. In the event that comments are generated on an Information Only submittal, the submittal may be dispositioned B or C and returned to the Subcontractor for appropriate action. Acknowledgment of receipt of dispositioned vendor data by the Subcontractor will not be required.

The Contractor will return dispositioned submittals with reasonable promptness. The Subcontractor shall note that a prompt review is dependent on timely and complete submittals in strict accordance with these instructions.

PART 2--PRODUCTS (SUBMITTAL REQUIREMENTS)

CERTIFIED MILL TEST REPORTS:

Where specifically required by other sections, certified mill test reports (CMTRs) shall be provided. The CMTRs shall be issued from the manufacturer who actively produces the item(s) and/or material to which the CMTR applies or a certified test laboratory. Each CMTR shall include the following:

1. Applicable codes and standards (such as ASTM or ASME) for the item(s) and/or material to which the CMTR applies.
2. General description of the item(s) and/or material to which the CMTR applies.
3. Heat or lot number of the item(s) and/or material to which the CMTR applies.
4. Actual chemical composition and the physical characteristics of the item(s) and/or material to which the CMTR applies. The physical characteristics noted shall include ultimate tensile strength, yield strength and elongation as a minimum. Reporting of physical characteristics is not required in the case of weld filler material unless otherwise noted in the applicable specification subdivision.
5. Signature and organizational title of the individual authorized to certify the accuracy of the data indicated on the CMTR for the item(s) and/or material shown.

EQUIPMENT DATA:

Where specifically required by other sections, equipment data shall be provided. As applicable and except as otherwise specified, equipment data shall include the manufacturer's name and address, the model number, and specific information on performance, operating curves and data, ratings, capacities, characteristic efficiencies, catalog data, equipment dimensions, evidence of compliance with safety and performance standards, and other data required to fully describe the equipment. Data shall be submitted in sets covering complete systems or functioning units. The data shall also be identified with the tag number of the equipment or device for which the data applies.

INSPECTION AND TEST PROCEDURES:

Where specifically required by other sections, inspection and test procedures shall be provided. Inspection and test procedures shall include, as applicable: description of item or items involved, inspection or testing to be performed, a listing of testing agency and technical personnel to be used, description of equipment and facilities to be used, test prerequisites, test methods, test evaluation and acceptance criteria, safety precautions, sign-off requirements, methods for control and calibration of measuring and test equipment, proposed test record form, references to applicable portions of the subcontract documents, and detailed procedures, methods, and criteria for evaluation and acceptance. Test procedures shall be prepared in accordance with the Subcontract Requirements Manual, PRD-5014 "Test Control".

INSPECTION AND TEST REPORTS:

Where specifically required by other sections, inspection and test reports shall be provided within 10 working days of such inspection or test. Inspection and test reports shall include, as applicable: identification of material or item inspected, inspection data, functional test data, date(s) and place(s) of inspection/tests, names of agencies and technicians involved, references to procedures and methods used, references to applicable portions of the subcontract documents, names of persons evaluating test results, identification of work failing to meet inspection/test acceptance criteria, and detailed description of corrective action taken. Test reports shall be provided in accordance with the Subcontract Requirements Manual, PRD-5014 "Test Control".

INSTALLATION, APPLICATION, AND ERECTION INSTRUCTIONS:

Installation, application, and erection instructions shall be provided where specifically required by other sections. Installation, application, and erection instructions shall be clear, concise, and detailed, and shall utilize drawings and pictures to the extent necessary. The instructions shall include procedures for delivery acceptance, unpacking, inspection, re-packing, storage, handling, preparation of supporting work, assembly, and incorporation of the material/equipment into the work. The instructions shall include sequences, precautions, and tolerances.

In general, the Contractor's Representative will inspect the work to the criteria and instructions prescribed in the manufacturer's installation, application and erection instructions. The Subcontractor shall not deviate from the written instructions without prior written approval and direction from the manufacturer; such approval and direction shall be submitted to the Contractor as an attachment to the manufacturer's installation, application and erection instructions.

MATERIAL AND EQUIPMENT LISTS:

Where specifically required by other subdivisions, material and equipment lists shall be provided. Material and equipment lists shall be complete for the work specified under the subdivision and shall include all materials, products, equipment, and fixtures, including consumables. Lists shall include manufacturer's name and address, trade or brand name, local supplier's name and address, unit quantities, and catalog numbers required to fully describe the item.

OPERATION AND MAINTENANCE (O&M) MANUALS:

Where specifically required by other sections, operation and maintenance manuals shall be provided.

Contents: O&M manuals for manufacturer's standard items shall, unless otherwise specified, be the standard publication issued for the product by the manufacturer.

O&M manual for special engineered items or systems shall, as a minimum, contain the following information when applicable, unless the information is requested and submitted separately:

1. Cover sheet identifying the project, site, Contractor, Subcontractor and identification of the specific equipment or system described therein.
2. Table of contents listing sections, paragraphs, subparagraphs, and the page numbers where each one starts.
3. General introduction and overall equipment and system descriptions, including purpose, function, and simplified theory of operation.
4. Safety considerations including load limits, voltages, capacities, speeds, temperatures, and pressures.
5. Start-up sequence instructions, operating instructions, and instructions for both normal and emergency shutdown sequences.
6. Recommended procedures and frequencies for preventive maintenance including inspection, tests, adjustment, lubrication, and cleaning.
7. Required preventative maintenance and frequency to ensure warranties.
8. Troubleshooting, checkout, repair, and replacement procedures.
9. List of test point locations for troubleshooting, and normal operating test values at each point provided.
10. List of lubricants and other consumables for each item of equipment, and approximate quantities needed per year; where possible, types of consumables shall be consolidated, with equipment manufacturer's approval, to minimize the number of different consumables required.
11. List of tools and equipment required for testing and maintenance.
12. Complete equipment list, supplier's equipment specifications, and equipment and product data.
13. Complete parts lists for each item of equipment reflecting the manufacturer's name, address, and telephone number; part number, nomenclature and exploded views of each assembly.
14. Spare parts list and information described in paragraph entitled "Spare Parts Lists".
15. Mechanical, electrical, and instrumentation schematics and diagrams for each item of equipment and the integrated systems.
16. Instrument/equipment calibration instructions, including calibration set points where applicable.
17. "As-Built" drawings and shop drawings.
18. Warranties including the name, address, and telephone number of the firm providing the warranty service.

O&M manuals shall be suitable for copying and microfilming.

PRODUCT DATA:

Where specifically required by other sections, product data shall be provided. Product data shall include descriptive material, such as catalog data, diagrams, color charts, and other data published by the manufacturer, as well as evidence of compliance with safety and performance standards. To demonstrate conformance to the specified requirements; catalog numbers alone will not be acceptable. The data shall include the name and address of the nearest service and maintenance organization that regularly stocks repair parts.

Product data submittals shall reference the applicable subdivision and drawings, and be complete for each item or unit of work.

SAMPLES:

Where specifically required by other sections, samples shall be provided. Samples shall be identical with final condition of materials or products proposed for the work. Two full sets of optional samples shall be provided when required. Information shall be provided with each sample to show generic description, source or product name and manufacturer, limitations, and compliance with standards. If requested by the Subcontractor, one sample set may be returned to be incorporated in the work. If incorporated into the work such sample shall be labeled in an approved manner and the installed location recorded on "Redline" drawings.

SHOP DRAWINGS:

Where specifically required by other sections, shop drawings shall be provided. Each shop drawing submittal shall be complete and shall be accompanied by technical and performance data as necessary to fully illustrate the information in the shop drawings, or cross referenced to such data contained in previous submittals. Unless otherwise specified, submittals shall consist of black-line printed copies. Hard copies and an electronic copy shall be submitted where required by other specification sections. Electronic copies of CAD generated drawings shall be provided in a form that will transfer to the Contractor's software using IGES or custom software provided by the Subcontractor. Sepia type prints are not acceptable. One set of copies will be returned to the Subcontractor marked to show the required corrections or approval.

The tag number indicated on the design drawings shall identify all equipment or other devices on the shop drawings. The Subcontractor shall identify all equipment and devices with tags or labels in accordance with the requirements specified in the respective subdivision.

The following additional submittals shall be required as indicated on the Vendor Data Schedule:

"Redline" Drawings: Copies of the shop drawings shall be updated to include all changes or modifications made during construction and to reflect the actual conditions

of construction. Each drawing shall be marked "As-Built" and be signed by the Subcontractor representative and shall be suitable for XEROX copying or microfilming.

Title Block and Identification: On each shop drawing, a 1-1/2 x 2-1/2 in. space shall be provided for the Contractor's review status stamp. Each shop drawing shall include a title block showing:

1. Project name and location.
1. Name and address of Subcontractor or manufacturer as applicable.
2. Date, scale of drawings, unique drawing identification number, and referenced design drawing number.
3. Subcontractor's review and approval stamp or signatures.
4. Revision record including signatures and dates.

Preparation and Size: Details and information shall be clearly drawn, dimensioned (including tolerances), noted, cross referenced and shall be of such quality as to ensure legible B (11 x 17 in.) size photocopy reproductions from microfilm (by others). Drafting and drawing standards shall be consistent with the practices established by ANSI Y14.1 or other acceptable standards and as specified herein:

Where applicable, views shall be oriented so that plant north faces to the left or up.

Use of abbreviations shall be avoided where space permits spelling in full; if used, abbreviations shall be described in a legend on the drawing.

Types: Shop drawings shall be of the specific types specified in the respective subdivisions. If a specific type is not specified, drawing shall be the type most commonly required for the specific class of work subject to the Contractor's approval. The most commonly required types of shop drawings and drawing content (as applicable) are described hereinafter.

Connection Diagrams: Shall indicate the relationships and connections of devices and apparatus. They shall show the general physical layout of all controls, the interconnection of one system, or portion of system, with another, and all internal tubing, wiring, and other devices. For simple installations, connection diagrams and interconnection diagrams may be combined onto a common drawing.

Control Diagrams: Shall show the physical and functional relationship of equipment. Electrical diagrams shall show size, type, of the systems. Pneumatic diagrams shall be furnished where gas systems are used. For simple installations, control wiring diagrams may be combined onto a common drawing.

Composite Drawings: Composite drawings shall show the work of one trade with that of other trades in the same contract and the structural and architectural elements of the work. Composite drawings shall be in sufficient detail to show overall

1 dimensions of related items, clearances, and relative locations of work in allotted
2 spaces.

3
4 Detail Drawings: Shall consist of dimensioned fabrication and assembly drawings for
5 all parts of the work in such detail to enable the Contractor to check conformity with
6 the contractual requirements.

7
8 Elementary Diagrams: Shall indicate, in straight-line form, without regard for
9 physical relationship, all supporting systems and elements of equipment and
10 associated apparatus.

11
12 Layout Drawings: Shall be consolidated for all trades in the subcontract, and show to
13 scale pertinent structural and fenestration features and other items, such as cabinets,
14 required for installation and which could affect the available space. Mechanical and
15 electrical equipment and accessories shall be shown to scale in plan, elevation and/or
16 section, in their installed positions. Duct work, plumbing, and piping shall also be
17 indicated. Submittals describing the various mechanical and electrical equipment
18 items, which are to be installed in areas represented by layout drawings, shall be
19 assembled and submitted concurrently with and accompanied by the room layout
20 drawings.

21
22 Fabrication, Erection, and Installation Drawings: Shall indicate equipment
23 arrangement and shall include dimensions, elevations, sections, and enlarged details
24 showing proper methods of field fabrication, construction, and installation.

25
26 Interconnection Diagrams: Shall be to scale and indicate interface between
27 associated units of equipment and between equipment and systems. Internal
28 equipment connections shall be shown on the connection diagrams. For simple
29 installations, connection and interconnection diagrams may be combined onto a
30 common drawing.

31
32 Outline Drawings: Shall indicate overall physical features, dimensions, ratings,
33 center of gravity, lifting points, service requirements, and weight of equipment.

34
35 Schematic Drawings: Shall show the functional flow of systems and their interfaces
36 with facilities and other systems. Functional and physical interfaces shall be
37 indicated. Schematics need not be to scale. Schematic may be structural,
38 mechanical, electrical, instrumentation or any combination of these with respect to
39 the equipment or systems to be installed.

40
41 Single-line Diagrams: Shall indicate, by means of single lines and simplified
42 symbols, the paths and component parts of systems. Items shall be clearly labeled to
43 indicate ratings and use in the system.

44
45 Wiring Diagrams: Shall identify all terminals, terminal blocks, and wires with wire
46 numbers and colors. All wires within enclosures and all wiring connections to

externally located equipment and devices shall be shown. For simple installations, wiring diagrams and control diagrams may be combined onto a common drawing.

Isometric Drawings: For piping systems, indicate three-dimensional piping layouts in the isometric format. Piping shall be represented as a single-line and in-line components shall be represented with standard drafting symbols.

SPARE PARTS LISTS:

Where specifically required by other sections, spare parts lists shall be provided. Spare parts lists shall include all spare parts and the current list price of each spare part. The spare parts lists shall also identify those spare parts, which each manufacturer recommends for maintenance at the site. Each manufacturer or vendor shall indicate the name, address, and telephone number of its spare parts source closest to the INEEL.

The Subcontractor shall cross-reference all spare parts lists to the equipment tag numbers designated in the specifications or on the drawings. If O&M manuals are specified for equipment, spare parts lists shall be submitted as part of the O&M manual.

CALCULATIONS:

Where specifically required by other sections, calculations shall be provided. Engineering calculations and analyses shall be fully checked by a qualified individual other than the originator, and shall be signed and dated as checked. All final submittals of calculations shall be bound and shall include the title and purpose of the calculation, a table of contents or index, complete list of references, design basis and complete list of assumption (if any), methodology, and sufficient information to allow independent verification of the calculation.

Calculations which are performed by computer or with computer assistance shall include a description of the hardware and software used, a description of the model employed if applicable, verification documentation for the computer program, and a copy of the computer input and output. All revisions to submitted calculations, as a result of comments by the Contractor or design changes by the Subcontractor, however minor, shall be resubmitted.

SPECIAL PACKAGING, HANDLING, OR STORAGE PROCEDURES:

Where specifically required by other sections, special packaging, handling, rigging, shipping, storage, or preservation procedures shall be provided. These procedures shall contain the following minimum requirements as applicable:

1. Measures taken to prevent damage during transit.
2. Detailed description of container design.
3. Overall dimensions and approximate weight of container and contents.
4. Recommended method for off-loading.
5. List of required special off-loading devices.
6. Special instruction for proper packaging and preventative maintenance during storage

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- 1 at the site.
- 2 7. Special instructions for marking.
- 3 8. Safety code labels, if applicable.
- 4

5 INTEGRATED MANUFACTURING, INSPECTION, AND TEST PLAN:

6
7 Where specifically required by other sections, an integrated manufacturing, inspection, and
8 test plan shall be provided. The integrated plan shall itemize the manufacturing, inspection,
9 and/or test procedure steps associated with initial material preparation through end product
10 delivery. The plan shall incorporate "source inspection hold points" as specified in the
11 individual section.

12
13 PART 3--EXECUTION (NOT APPLICABLE)

14
15 END OF SECTION 01300

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SECTION 02200--EARTHWORK

PART 1--GENERAL

SUMMARY:

Work includes, but is not limited to:

Clearing and grubbing as required.

Excavating all materials encountered, of every description, for completion of the Subcontract as shown on the drawings and as specified herein.

Backfilling of all excavation for footings, foundations, pipe and utility trenches, etc.

Installing a locator ribbon above utilities installed under this Subcontract.

Compacting all backfill as specified herein.

Finish grading and grading for surface drainage.

REFERENCES:

The following documents, including others referenced therein, form part of this Section to the extent designated herein.

AMERICAN ASSOCIATION OF STATE HIGHWAY TRANSPORTATION OFFICIALS
(AASHTO)

	Standard Specifications for Transportation Materials and Methods of Sampling and Testing
AASHTO M145	Recommended Practice for the Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
AASHTO T11	Standard Method of Test for Materials Finer Than 75 Micrometer (No. 200) Sieve in Mineral Aggregates by Washing
AASHTO T27	Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates
AASHTO T99	Standard Method of Test for the Moisture-Density Relations of Soils Using a 5.5-lb (2.6-kg) Rammer and a 12 in. (305 mm) Drop
AASHTO T238	Standard Method of Test for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

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CODE OF FEDERAL REGULATIONS

29 CFR 1926 OSHA Safety and Health Regulations for Construction,
Subpart P - Excavation

IDAHO TRANSPORTATION DEPARTMENT (ITD)

SSHC Standard Specification for Highway Construction

SUBMITTALS:

No vendor data required for this section unless an "or-equal" item is proposed.

PART 2--PRODUCTS

MATERIALS:

Satisfactory Soil Materials: Satisfactory soil materials are defined as those complying with AASHTO M145, soil classification Groups A-1, A-2-4, A-2-5, and A-3.

Unsatisfactory Soil Materials: Unsatisfactory soil materials are those defined in AASHTO M145 soil classification Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7; also peat and other highly organic soils.

Backfill and Fill Material: "Satisfactory" soil materials free of clay, rock, gravel larger than 6 in. in any dimension, debris, waste, frozen materials, vegetable and other deleterious matter. Select pit run gravel is available at the ICDF Stockpile near this site. The stockpile material shall be at no cost to the Subcontractor. Upon completion of operations involving backfill and fill material removal, the Subcontractor shall grade and reshape the disturbed areas. Sloped surfaces shall meet the requirements of OSHA 29 CFR 1926.

Sand: Sand for bedding shall be minus 3/8" satisfactory soil material. Sand shall be used for bedding pipe, to overlay the secondary containment system and to provide bedding for the contaminated equipment storage pad.

Base or Leveling Course Material: Naturally or artificially graded mixture of 3/4 in. maximum size crushed gravel, crushed stone, natural and crushed sand. Material shall meet the requirements of ITD subsection 703.04.

Buried Pipe Identification Ribbon: See the appropriate Piping or Electrical specifications for Buried Pipe Identification Ribbon requirements.

Locator Ribbon: Ribbon shall be 3 in. wide and shall be red for all electrical conduits, electrical cables, and telephone cables. Yellow ribbon shall be used for all buried pipelines. Ribbon shall be tape manufactured by Reef Industries or Allen Markline and shall have metal foil which is completely encased in plastic so as to be unaffected by cathodic protection

systems and can be easily detected by metal detectors. The ribbon shall be printed with the manufacturer's standard wording, "CAUTION ELECTRIC LINE BURIED BELOW," for all electrical conduits, phone lines, etc., "CAUTION BURIED PIPELINE BELOW," for all buried pipelines.

PART 3--EXECUTION

EXCAVATION:

Clearing and Grubbing: Areas 1 and 3 as shown on the plans, plus 3 ft outside these areas shall be stripped and cleared of all brush, weeds, rubbish and organic matter. All vegetable matter, roots, brush and debris encountered during the stripping operations shall be removed from the cleared areas to a depth of at least 12-in. below the natural ground. Stripped material shall be stockpiled adjacent to Aspen Avenue as shown on the drawings and as directed. Stripped material including vegetation shall be used to flatten slopes and spread over disturbed areas for the final reclamation. Exposed fill slopes on the roadways and site improvement shall be seeded in accordance with subsection 02436--Revegetation.

Install a silt fence around the stockpile in accordance with the drawings.

The existing vegetation shall be retained and protected in Area 2 as shown on the plans.

Earth Excavation: Earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, soil material of any classification, and other materials encountered that are not classified as rock excavation or unauthorized excavation.

After clearing and grubbing, excavate the existing overburden in Area 3 shown on the plans down to the gravel interface (approximately 2-ft.). Stockpile the excavated materials in the ICDF overburden stockpile as directed. Construction of drainage ditches as required shall be considered as earth excavation.

Unauthorized Excavation: Unauthorized excavation consists of removal of materials beyond indicated elevations or dimensions without specific direction by the Contractor. Unauthorized excavation, as well as remedial work directed by the Contractor, shall be at the Subcontractor's expense.

Structural: Excavations for such structures as footings, foundations, and slabs shall be made to the depths shown on the drawings and of sufficient width to allow adequate room for setting and removing forms, installing accessories and inspection. Where concrete foundations or slabs are to be constructed on material other than rock, care shall be taken to prevent disturbing the bottom of the excavation. Excavation to final grade shall not be made until just before concrete forms are to be placed therein. Concrete foundations shall be placed only on undisturbed soil or rock.

Shoring and Bracing: The sides of all excavations shall be sloped or securely shored and braced in accordance with OSHA 29 CFR 1926, Subpart P.

TRENCH EXCAVATION:

Trenches: Trenches shall be of sufficient width to provide adequate room for workmen to perform any necessary service to the materials or items being installed therein and to permit proper compaction of the backfill.

Roads and Sidewalks: Where trench excavations are required across roads or streets, one lane shall be kept open to traffic at all times unless otherwise directed. This shall be accomplished by excavating and backfilling only one-half of the road or street at one time. Temporary footbridges, with a handrail on both sides, shall be provided over excavation through sidewalks.

Grade: The bottom of pipe trenches shall be graded to allow for a minimum of 4 in. of compacted sand bedding beneath the pipe. Bell holes shall be shaped so that pipe will be uniformly supported for its entire length on the compacted sand backfill. Hubs or flanges shall be unsupported until the pipeline has been tested, coated, and wrapped, as required.

Stockpiling and Disposal: Excavated material that is suitable and required for backfilling, grading or topsoil, shall be piled in an orderly manner a sufficient distance from the edge of the trench excavation, but in no case closer than 2 ft, and so located that it will not interfere with normal vehicular or pedestrian traffic. Excavated materials to be used for backfill shall be kept free from vegetation and other objectionable materials. Topsoil to be used for finish grading shall be kept free from subsoil, vegetation and other objectionable materials and stones larger than 1-in. Excavated materials not required or not approved for backfilling, grading or topsoil, shall be stock piled in the ICDF stockpile. Unused excavated earth and rock waste and combustible materials shall be hauled to areas designated by the Contractor and disposed of in a manner specified in the Special Conditions and in accordance with the Waste Management Plan.

Unstable Soils: If wet or otherwise unsatisfactory soil is encountered in an excavation, at or below the excavation line, it shall be brought to the attention of the Contractor and removed as directed in accordance with Article 38, "Differing Site Conditions", of the General Provisions. The bottom of the excavation shall then be brought to the required grade with concrete or compacted backfill as specified hereinafter. Excavation of unstable soil resulting from the Subcontractor's neglect to keep the excavated opening dry, and other over depth excavation not required to satisfactorily complete the work, shall be brought up to the required grade with concrete or compacted backfill as specified hereinafter at the Subcontractor's expense.

Shoring and Bracing: The sides of all excavations shall be sloped or securely shored and braced in accordance with OSHA 29 CFR 1926, Subpart P.

1 **BACKFILL:**

2
3 **General:** The excavations shall be cleared of all trash and debris prior to backfilling or
4 filling. All backfill or fill material shall be free from trash, organic matter and frozen
5 particles. Installation and testing of all piping shall be approved by the Contractor prior to
6 backfilling. Backfilling or filling shall be done only when approved by the Contractor. In
7 excavations that are shored, shoring and formwork shall be removed or raised as backfill or
8 fill is placed.

9
10 **Under Footings and Foundations:** Footings and foundations for columns and for heavy
11 equipment shall not be placed on earth backfill. Over depths in excavations for such footings
12 and foundations shall be backfilled with concrete. The concrete shall be in accordance with
13 the "Concrete" section of these specifications.

14
15 **Under Slabs or Pavement:** Backfill or fill materials under concrete slabs, floors, sidewalks,
16 and concrete or asphalt pavement including fill for manholes shall be compacted fill material
17 as specified in the "Materials" section. The last 2 in. of fill shall be compacted leveling
18 course material for stoops and approach slabs and 2 in. of compacted sand for the
19 contaminated equipment storage pad and 6 in. of compacted sand under the floor of the
20 Decontamination Building. All work and compaction shall be done in accordance with the
21 plans of these specifications and as directed.

22
23 **Pipelines and Lift Stations:** Bedding for piping and lift stations shall be compacted sand or
24 other approved granular material unless otherwise shown on the drawings. Bedding material
25 shall extend from a minimum of 4 in. beneath the pipe or tank to a minimum cover of 4 in.
26 The remainder of the trench or excavation shall be backfilled and compacted as specified
27 hereinafter.

28
29 **Overdepth Pipeline Excavation:** Where pipe trenches are excavated to an overdepth due to
30 the presence of rock, unstable soil or other unsuitable material, the overdepth shall be
31 backfilled to required grade with compacted sand or other approved granular material.

32
33 **Placement:** Concentrated dumping of backfill or fill material into excavations will not be
34 permitted. No water shall be used for placing, settling or compacting backfill or fill except to
35 obtain optimum moisture content. All material must be placed in uniform layers not to
36 exceed 8 in. loose measurement and brought up simultaneously and evenly on both sides of
37 foundation walls and around underground or covered structures and equipment such as
38 culverts, manholes, storage tanks and pipe. Backfill or fill around piping, and at least 4 in.
39 over, shall be hand placed and compacted prior to pressure testing. Pipe joints shall be left
40 exposed until leak testing has been completed. Care shall be taken when backfilling, filling,
41 or compacting around any buried items or dampproofed walls to prevent injury to the item
42 being covered and to prevent piercing or rupturing the insulation, coating or dampproofing
43 membrane. Loose backfill or fill may be placed as specified hereinafter.

Compaction: Unless otherwise indicated on the drawings or specifications, compact all backfill and fill and base course material under slabs, roads, sidewalks, and other surfaced areas, around foundation walls, culverts and other similar structures and to at least 4 in. compacted depth above all piping in trenches. Unless otherwise indicated, all "compacted" backfill or fill shall be compacted to at least 95% of maximum dry density at optimum moisture content \pm 2% as determined by AASHTO T99. Each 8-in., maximum, loose measurement lift shall be compacted before the next lift is placed thereon. Compacted backfill or fill density and moisture content may be measured by the Contractor at any location and depth. Sections of backfill or fill failing to meet the minimum compaction requirements shall be corrected prior to placement of subsequent lifts. No heavy equipment shall be allowed within 5 ft of a structure or the foundation of any structure. No heavy equipment shall be allowed over piping until a minimum of 24 in. of backfill has been compacted over the piping.

Haunches under the pipe shall be thoroughly compacted. In addition, the larger diameter (>6") shall be backfilled with equal lifts on each side.

PLACING PIT RUN GRAVEL FILL:

General: Construct pit run gravel fills, in Areas 1 and 3, including the preparation of the subbase upon which the gravel is to rest, in accordance with this specification, and to the lines, grades, and typical cross sections shown on the drawings.

Construction Requirements: Prior to placement of the pit run gravel base, the existing subbase shall be stripped of all vegetation, brought to optimum moisture content, and compacted to at least 90% maximum density as determined by the AASHTO T99.

Material containing excessive moisture shall be permitted to dry to a moisture content that will permit the required compaction. No extra payment will be made for rehandling such material to permit drying. Material that does not contain sufficient moisture to compact to the required density shall be uniformly moistened as required.

Area Grading:

- **Area 1 – Parking and Laydown Area**

After clearing and grubbing, the area shall be filled with 1 to 2 feet of compacted pit-run gravel. This will provide fill material to grade for drainage. The area shall be graded so that it will drain from the south to the north.

- **Area 2 – Retain and Protect Vegetation**

- **Area 3 – SSSTF Site Grading**

Fill the area to the lines and grades shown on the drawings with compacted pit run gravel.

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In the area to be unpaved the pit run gravel shall be left 0.75-ft. below the design grade to accommodate future crushed gravel and pavement. For this project, additional pit run gravel shall be used to grade to the scales, decontamination building and the contaminated equipment storage pad.

In areas to be paved, the pit run gravel will be left 0.75-ft. low to accommodate the crushed base and paving. The crushed aggregate base and plant mix thickness is planned for 0.75-ft. and will be placed in the areas shown on the plans.

- **Area 4**

Area 4 as shown on the plans to be paved with 0.5-ft of crushed aggregate base and 0.25-ft of asphalt concrete

Materials not compacted to the specified density in this specification shall be excavated and recompacted to the requirements for the compaction specified at no cost to the Government.

PLACING CRUSHED GRAVEL BASE COURSE:

General: Furnish and place crushed gravel as a base course and as shoulder protection in accordance with the plans and specifications.

Construction Requirements: Crushed gravel shall be mixed by motor graders or other approved equipment until the mixture is uniform throughout. During the mixing, water shall be added in an amount necessary to facilitate compaction. Use watering equipment specified in this specification.

Locator Ribbon: The locator ribbon shall be placed in a zone 6 to 12 in. from the ground surface directly over the utility during the backfill and compaction operation.

FIELD QUALITY CONTROL:

Surveillance will be performed by the Contractor's Representative to verify compliance of the work to the drawings and specifications.

END OF SECTION 02200

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1 SECTION 02430--CULVERTS

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 Work shall include furnishing and installing new culverts in accordance with these
8 specifications and the subcontract drawings.

9
10 Work includes, but is not limited to:

11
12 Furnish and install corrugated metal pipe (CMP) culverts as shown on the drawings.

13
14 REFERENCES:

15
16 The following documents, including others referenced therein, form a part of this Section to
17 the extent designated herein:

18
19 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

20
21 ASTM A 798 Standard Practice for Installing Factory-Made Corrugated Steel Pipe
22 for Sewers and Other Applications

23
24 SUBMITTALS:

25
26 Submittals not required for this subsection.

27
28 PART 2--PRODUCTS

29
30 MATERIALS:

31
32 Culverts: The culverts shall be 16-gage minimum galvanized or aluminized corrugated steel
33 pipe with standard connection band at all joints.

34
35 PART 3--EXECUTION

36
37 INSTALLATION:

38
39 Location: Install culverts to lines and grades shown on the drawings and match drain lines.

40
41 Earthwork: Excavation, backfilling and grading shall be performed in accordance with
42 Section 02200 Earthwork. Bedding for corrugated metal pipe shall be in accordance with
43 ASTM A 798 standard practice for installing factory-made corrugated steel pipe for sewers
44 and other applications.
45

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1 Laying Corrugated Metal Pipe: The outside laps of circumferential joints shall point
2 upstream and longitudinal laps shall be at the sides. The lugs on the coupling bands of metal
3 pipe shall be placed to one side of the top of the center line of the pipe so that they will not
4 extend above the top of the pipe.
5

6 The space between the pipe and the connecting band shall be kept free from dirt so that
7 corrugations fit snugly. The connecting band, while being tightened, shall be tapped with a
8 soft-head mallet to take up slack and insure a tight joint.
9

10 Pipe Testing: Hydrostatic pressure testing will not be required.
11

12 FIELD QUALITY CONTROL:
13

14 Surveillance will be performed by Contractor's Representative to verify compliance of the
15 work to the drawings and specifications.
16

17 END OF SECTION 02430

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1 SECTION 02452--SIGNAGE

2
3 PART 1--GENERAL

4
5 SUMMARY

6
7 The Subcontractor shall supply all labor, material, and equipment to provide signs in
8 accordance with the drawings and these specifications.

9
10 Section Includes, but is not limited to:

11
12 Furnish and install signs as shown on the drawing.

13
14 Related Sections:

15
16 02200 Earthwork

17
18 REFERENCES:

19
20 The following documents, including others referenced therein, form part of this Section to
21 the extent designated herein:

22
23 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

24
25 ASTM A 36 Standard Specification for Carbon Structural Steel
26 ASTM A 307 Standard Specification for Structural Bolts, Steel, Heat Treated
27 ASTM B 209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and
28 Plate
29 ASTM D 245 Standard Practice for Establishing Structural Grades and Related
30 Allowable Properties for Visually Graded Lumber
31 ASTM D 4956 Standard Specification for Retroreflective Sheeting for Traffic Control

32
33 AMERICAN WOOD PRESERVERS ASSOCIATION (AWPA)

34
35 AWP A C-14 Wood for Highway Construction - Preservative Treatment by Pressure
36 Processes
37 AWP A P-4 Standard for Petroleum Oil for Blending with Creosote
38 AWP A P-9 Standards for Solvents and Formulations for Organic Preservative
39 Systems
40
41

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FEDERAL HIGHWAY ADMINISTRATION

MUTCD Manual on Uniform Traffic Control Devices

SUBMITTALS:

No vendor data required for this section unless an "or-equal" item is proposed.

QUALITY CONTROL:

Codes and Standards: Comply with the provisions of the referenced codes and standards, unless otherwise specified herein.

PART 2--PRODUCTS

MATERIALS:

Signs: Signs shall conform to the applicable requirements of the Federal Highway Administration's MUTCD. Stop signs shall comply with MUTCD R1-1.

Wood Sign Posts: Four-inch by four-inch sign posts shall conform to Grade No.1 as developed in accordance with ASTM D 245. Posts shall be preserved by pressure treatment with pentachlorophenol in accordance with AWWA P-9 or, as an alternate, chromated copper arsenate (CCA) in accordance with the requirements of AWWA C-14 and P-4.

Hardware for Signs: Structural steel for brace angles and brackets shall conform to ASTM A 36. High strength bolts, nuts and washers for sign posts shall conform to ASTM A 307.

Sheet Aluminum: Sheet aluminum shall conform to ASTM B 209, Alloy 6061-T6 or 5052-H38 with an alodine 1200 finish. Sheet aluminum for flat aluminum signs shall have a 0.080-inch minimum thickness. Sheet aluminum shall contain a minimum of 25%-recovered material.

Reflective Sheeting: Reflective sheet shall conform to ASTM D 4956, Type I, Class 2. The background for aluminum signs shall be reflective sheeting.

Legends: Legends shall consist of reflective sheeting or plastic lettering film.

Plastic Lettering Film: The material shall consist of a flexible, glossy black, plastic film with a tack free adhesive coating on the back side and a paper liner attached to the face side of the film. The film shall be solvent resistant. The precoated adhesive shall be either pressure sensitive or activated by the application of heat or solvent.

Applied as directed by the manufacturer, the film shall form a durable bond with the reflectorized sign background sheeting enabling it to withstand severe weather conditions without appreciable loss of bond.

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1 PART 3--EXECUTION

2
3 General: Signs shall be located as shown on the drawings.

4
5 Posts: Auger or dig a cylindrical hole. Place and compact backfill in accordance with
6 Division 2 Section, "Earthwork". Posts shall be plumb and at proper elevation.

7
8 It is not anticipated that rock drilling will be required for the placement of the posts. If
9 required, it shall be brought to the attention of the Contractor.

10
11 Installation: Signs shall be installed as shown on the drawings. Signs shall be mounted at
12 right angles to the direction of, and facing, the traffic they are intended to serve.

13
14 FIELD QUALITY CONTROL:

15
16 Surveillance will be performed by Contractor's Representative to verify compliance of the
17 work to the drawings and specifications.

18
19 END OF SECTION 02452

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SECTION 02486--REVEGETATION

PART 1--GENERAL

SUMMARY:

Work includes, but is not limited to:

Preparing seedbeds, sowing grasses, applying fertilizer, and applying mulch to revegetate disturbed sites.

SUBMITTALS:

No vendor data required for this section.

PART 2--PRODUCTS

MATERIALS:

Topsoil: Clean topsoil free from any toxic minerals, noxious weeds or other objectionable material.

Grass Mix: The following grass mix shall be used for roadsides and all other disturbed areas not designated as greenstrips:

SPECIES	SEEDING RATE [PURE LIVE SEED (PLS) lbs/acre]
Secar Bluebunch Wheatgrass (Pseudoroegneria Spicata)	3
Bottlebrush Squirreltail (Elymus Elymoides)	2
Sandberg Blugrass (Poa Secunda)	2
Sodar Streamband Wheatgrass (Elymus Lanceolatus)	3
Green Rabbitbrush (Chrysothamnus Viscidiflorus)	0.25
Total	10.25

Fertilizer: Fertilizer shall be 16-48-0 (NPK) ammonium or diammonium phosphate. Each component of the fertilizer may vary two percent.

Mulch: Mulch shall be processed grass straw free of noxious weeds and other deleterious materials.

EQUIPMENT:

Seedbed Preparation: Disks, harrows, roller harrow-packers (culti-packers), tooth type harrows, shovels, or other similar equipment.

Seeding and Fertilizing: Drills with double disc and agitator, ground driller hand seeder, culti-packer with seed boxes, Brillion seeder, or other similar equipment.

PART 3--EXECUTION

Season of Work: Seeding shall be done between October 10 and November 30. Specific ideal seeding times within these windows shall be as required for proper seedbed preparation.

Weed Control: Areas to be seeded shall be maintained reasonably free of weeds. Weeds shall be kept from going to seed.

Seedbed Preparation: Soil shall be tilled a minimum depth of 4 inches. The seedbed shall be firm below seeding depth and well pulverized and loose on top. It shall be free of clods and weeds. Seedbed preparation shall not be performed when soil conditions are not suitable for tilling: too dry, too wet, frozen, etc. Tillage shall produce cross-slope furrows on slopes.

On areas subject to severe erosion, the extent of seedbed preparation shall not exceed that which can be seeded in one day.

Fertilizing: Fertilizing shall closely follow seedbed preparation. Fertilizer shall not be mixed with seed. Fertilizer may be drilled or broadcast. Fertilizer shall be applied at a rate of 50 pounds per acre.

Seeding: Seeding shall closely follow fertilizing. If the seedbed has been disturbed, then the Subcontractor shall prepare the seedbed again. Seeding work shall not proceed until the seedbed has been inspected. Seeds shall be thoroughly mixed prior to application. Seeds shall be uniformly applied at the previously specified rate. Seeds shall be buried 0.25 to 0.75 inches. Seeding shall not be performed when weather conditions are unfavorable: high wind, heavy rain, etc.

Drilling shall maintain cross-slope furrows on slopes.

Mulching: Mulch shall be spread uniformly at a rate of 1 ton per acre. Mulch shall be anchored into the soil to a depth of at least 2 in. and with no more than one pass of the equipment. Mulching shall not be performed when wind interferes with mulch placement.

Protection: Traffic over seeded area shall be prohibited.

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1 FIELD QUALITY CONTROL:
2

3 Seedbed Inspection: Seeding shall not proceed until the Contractor's Representative has
4 inspected the seedbed for conformance to these specifications.
5

6 Surveillance will be performed by the Contractor's Representative to verify compliance of
7 the work to the drawings and specifications.
8

9 END OF SECTION 02486

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SECTION 02513--ASPHALT CONCRETE PAVING

PART 1--GENERAL

SUMMARY:

Provide all work, operations and material required to construct asphalt paving in accordance with the project drawings and these specifications.

Work includes, but is not limited to:

Haul, place and compact asphalt concrete mix on new roads and parking areas.

Patch all paved areas where excavation occurred

Furnish and apply asphalt tack coat.

REFERENCES:

The following documents, including others referenced herein, form part of this Section to the extent designated herein:

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS (AASHTO)

AASHTO Standard Specifications for Transportation Materials and Methods of Sampling and Testing

AASHTO T11 Standard Method of Test for Materials Finer Than 75 Micrometer (No. 200) Sieve in Mineral Aggregates by Washing

AASHTO T27 Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 946 Standard Specification for Penetration Graded Asphalt Cement for Use in Pavement Construction.

ASTM D 2922 Standard Test Methods for Density of Soil and soil-Aggregate In Place By Nuclear Methods (Shallow Depth)

ASTM D 4791 Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate

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IDAHO TRANSPORTATION DEPARTMENT (ITD)

Standard Specifications for Highway Construction (SSHC)
1995 Edition, Field Test Manual, Part I, Sampling and Test
Methods

SUBMITTALS:

Submittals include, but are not limited to the following:

Product Data: Source of asphalt concrete.

Sample: Submit a 200-lb sample of aggregate to an independent test laboratory for testing unless the aggregate source has been used on the INEEL within the last two years.

Sieve Test Report: Submit sieve test report of aggregate to be used for approval.

Mix Design Test Report: Submit results of the asphalt concrete mix design test.

See Section 01300, Submittals and Vendor Data Schedule for additional submittal requirements.

QUALITY CONTROL:

Codes and Standards: Comply with provisions of the following codes, specifications and standards unless otherwise specified herein. Idaho State Specifications are available for inspection at offices of the Division of Highways, State of Idaho in Rigby, Idaho, and the Department of Energy (DOE), Idaho Operations Office Headquarters.

AASHTO	Standard Specifications for Transportation Materials and Methods of Sampling and Testing
--------	--

ASTM D 946	
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SSHC	Standard Specifications for Highway Construction (SSHC) 1995 Edition, Field Test Manual, Part I, Sampling and Test Methods
------	---

PART 2--PRODUCTS

Asphalt Binder: The asphalt cement shall be PG-58-28. Asphalt shall meet applicable requirements of Section 702 of the SSHC, AASHTO M226/Table 1, and ASTM D 946.

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Crushed Gravel Aggregate: The master gradation for aggregate for the plant mix pavement shall be as follows:

<u>Sieve</u>	<u>Percent Passing</u>
3/4	100
1/2	90 - 100
No. 4	51 - 61
No. 8	37 - 47
No. 50	18 - 26
No. 200	5 - 10

Tack Coat: The tack coat shall be an emulsified asphalt, SS-1 or SS-1h, diluted with one part water to one part emulsified asphalt, meeting the applicable requirements of Section 702 (SSHC).

PART 3--EXECUTION

QUALITY CONTROL TESTING:

Contractor Supplied Testing: The following tests may be performed by others at no cost to the Subcontractor:

AASHTO T99 (Standard Proctor) for density of the base course.

AASHTO T238 (ASTM D 2922) for moisture-density relationship of base course in place and asphalt concrete in place.

Idaho T125 (Nuclear Densimeter) for asphalt concrete in-place density.

Idaho T87 for surface smoothness of finished pavement.

Subcontractor Supplied Testing: A sieve report of aggregate to be used shall be submitted for approval.

The test methods shall be in accordance with the following:

Mechanical Analysis	AASHTO T27
Passing a No. 200 Sieve	AASHTO T11

A tolerance of 2% in the amount passing the maximum size screen will be permitted to allow for reasonable screen wear, providing all oversize material passes a screen having 1/8 in. larger opening.

Composition of Mixture: The asphalt concrete shall be composed of a mixture of aggregate, filler if required, and asphalt. The mix design shall be tested by an independent test

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laboratory based on the aggregate gradation before mentioned, and shall meet the following criteria:

Marshall Method:

Stability: 500-lb minimum
Flow: 8 to 20
Air Voids: 3% to 5%

HVEEM Method:

Stability: 37 minimum (See 405.02 of SSHC)
Swell: Less than 0.030 in.
Air Voids: 3% to 5%

The mix design test results shall be submitted for approval, and the approved design mix shall be in effect unless modified in writing by the Contractor.

After the mix design is established, all mixtures furnished for the project shall conform thereto within the following ranges of tolerances:

Passing No. 4 and Larger Sieves	± 7%
Passing No. 8 to No. 100 Sieves, inclusive	± 4%
Passing No. 200 Sieve	± 2%
Asphalt	± 0.4%
Temperature of Mixture	± 20° F

Should a change in sources of material be made, a new mix design shall be established before the new material is used; when unsatisfactory results or other conditions make it necessary, the Contractor may establish a new mix design.

The aggregate and asphalt shall be mixed in accordance with SSHC Section 405.11.

EARTH EXCAVATION:

Excavation, plowing pit run gravel and crushed aggregate shall be performed in accordance with Section 02200, "Earthwork".

SURFACE PREPARATION:

The Subcontractor shall sawcut the existing asphalt concrete back 6-10 inches from the edge of excavation in a neat, vertical straight line.

Existing asphalt shall be cleaned to permit adhesion of bituminous materials. The prepared base on new and old areas to be paved shall be kept in repair at all times in advance of placing the plant mix pavement. Holes or depressions shall be filled level with bituminous

1 surfacing, brought to the required grade and compacted. Do not commence placing asphalt
2 until all conditions are satisfactory.

3
4 Tack Coat: Apply to contact surfaces of previously constructed asphalt or portland cement
5 concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at
6 rate of 0.10 gal per sq. yd. of surface.

7
8 Allow to dry until the tack coat has reached the proper condition to receive paving.

9
10 PLACING AND FINISHING ASPHALT CONCRETE:

11
12 General: Prior to placing the mixture on the roadbed, the prepared base shall be satisfactorily
13 cleaned of all loose and foreign material. Uniformity of temperatures of the mixture
14 delivered to the paver shall be such that the temperature of any one load shall not vary more
15 than 20° F from the average of the preceding five loads. The material shall be placed to the
16 specified thickness. Placing of the paving mixture shall be as continuous as possible.

17
18 Joints: Longitudinal joints shall be smooth, straight, and show no segregation of material.
19 Should irregularities in the edge of the surface appear, the previous lane shall be sawcut back
20 to a vertical face before placing adjacent material. Any material removed in cutting back the
21 course to a vertical face shall be removed and wasted.

22
23 Transverse joints shall be formed by cutting back on the previous run or existing asphalt to
24 expose the full depth of the course. A brush coat of SS-1 emulsified asphalt shall be used on
25 contact surfaces of transverse joints, cold longitudinal joints, and existing asphalt edges just
26 before additional mixture is placed.

27
28 Sawcuts shall be straight and clean.

29
30 Rolling: The asphalt concrete shall be compacted as quickly as possible after placing.
31 Breakdown rolling shall follow the paver as closely as possible. Intermediate rolling shall
32 follow immediately behind the breakdown rolling. Compaction of the pavement shall
33 continue until the pavement density is 96% of that specified in the approved laboratory
34 report. Testing of the plant mix density will be performed according to Idaho Department of
35 Highways Method of Test T125 (Nuclear Densimeter). All breakdown and intermediate
36 compaction shall be performed while the mixture temperature is above 180° F. Finish rolling
37 shall be performed at as high a temperature as practicable and shall eliminate marks from
38 previous rolling. Finish rolling shall be done the same day as the paving. Rollers shall not
39 pass over the unprotected end of a freshly laid mixture.

40
41 Surface Smoothness: The completed surface will be inspected in accordance with Idaho
42 Transportation Department Division of Highways Method of Test T87. The surface shall not
43 vary more than 1/4 in. from a 10-ft straight edge.

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Weather Limitations: Plant mix material shall not be placed on a wet or frozen surface, when the air temperature is below 40° F, or when weather or surface conditions otherwise prevent the proper handling or finishing of the plant mix material.

EQUIPMENT REQUIREMENTS:

Mixing Plant: The mixing plant shall conform to the applicable portions of Section 405.06 SSHC.

Hauling Equipment: Trucks used for hauling plant mix materials shall have tight, clean, smooth metal beds. When necessary each truck shall have a cover of canvas or other suitable material of such size as to protect the mixture from the weather. When necessary, so that the mixture will be delivered on the road at the specified temperature, truck beds shall be insulated and covers shall be securely fastened.

Paver: Pavers shall be self-propelled units, provided with an activated heated screed. Only screed extensions that produce results equal to the rest of the screed will be allowed.

The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed.

The paver shall be operated at a speed consistent with the delivery of plant mix, which provides for a smooth, uniform forward travel with the least stops.

The screed shall be equipped with automatic controls, which will make adjustments in both transverse, and longitudinal directions. The sensing device shall pick up grade information from a ski that is a minimum of 30 ft in length. The ski may be removed when paver is required to operate in areas of limited space (parking areas, turnarounds, fillets, etc.,). In the event of failure of the automatic controls, the Subcontractor will be permitted to finish the day's run using manual controls, but he will not be permitted to resume operations until the controls are repaired.

Rollers: Nonvibrating steel-wheel rollers shall be multiple axle, self-propelled, equipped with cleaning devices and weighing from 8 to 12 tons. Pneumatic-tire rollers shall be self-propelled and constructed within the limits of 50 to 100% of the values set in groups No. 2, 3, and 4 as set forth in Section 306 (SSHC). Rollers shall be equipped with a means of distributing the load uniformly between all wheels on at least one of the axles. The use of wobble-wheel rollers whose tires revolve in a plane that is not at right angles to the axle shaft will not be permitted. Rollers shall be multiple axle, multiple wheel type with wheels staggered on the axles and spaced so that the overlap of wheels will provide for uniform compaction for the full compacting width of roller. The air pressure in any tire shall not vary more than 5 lb. from the pressure established. The rollers shall be operated at speeds of not less than 3 nor more than 8 miles per hour.

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1 Scales: DOE-owned scales located in the Central Facilities Area may be used at no cost to
2 the Subcontractor, or the Subcontractor may furnish his own scales. Scales shall meet the
3 applicable portions of Section 109.01 (SSHC).
4

5 Watering Equipment: Provide water tank trucks capable of applying a uniform unbroken
6 spread of water over the surface. A suitable device for positive shut-off and regulation of
7 flow shall be located to permit operation by driver in cab.
8

9 FIELD QUALITY CONTROL:

10
11 Surveillance will be performed by the Contractor's Representative to verify compliance of
12 the work to the drawings and specifications.
13

14 END OF SECTION 02513

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1 SECTION 02598--SECONDARY CONTAINMENT LINER SYSTEM

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 The Subcontractor shall supply all labor and materials required to provide secondary liner
8 system consisting of a primary non-woven geotextile fabric, a HDPE geomembrane, a double
9 lined geocomposite (geotextile/geonet) and overlaid with a layer of clean concrete sand.

10
11 Work includes, but is not limited to:

12
13 Furnish and install the secondary containment system as shown on the drawings and
14 this specification.

15
16 Attach membrane liners of the secondary containment to the piping and concrete
17 structures as shown on the drawings and as directed.

18
19 REFERENCES:

20
21 The following documents, including others referenced therein, form part of this Section to
22 the extent designated herein:

23
24 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

25
26 SUBMITTALS:

27
28 Submittals include but are not limited to the following:

29
30 Quality Control Plan: Submit a quality control plan for fabrication and installation of the
31 secondary containment system for approval. Specific details shall be shown where sealing
32 around pipe penetrations and other structures.

33
34 Shop Drawings: Submit drawings showing proposed secondary containment liner layout
35 including field seams, details, and ballast.

36
37 Installation Instructions: Submit installation instructions for the secondary containment
38 system. Specific details shall be provided showing how sharp angle connections are to be
39 made and proper overlap required.

40
41 Certification: Submit certification that the material supplied meets the Materials
42 requirements.

43
44 As-Built Drawings: Submit as-built redline drawings showing actual secondary containment
45 liner placement and seams including typical anchor details.

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Test Reports: Submit test procedures and reports for liner fabrication and seam inspection.

Qualifications: Submit certification of personnel performing fabrication and installation of the fabric. Submit the names of the projects and references, which document the Subcontractor's qualifications.

Product Warranty: Submit warranty of the various liner components of the secondary containment system.

Workmanship Warranty: Submit warranty on workmanship for the Installation of the Secondary Containment System.

See Section 01300, Submittals and Vendor Data Schedule for additional submittal requirements.

DELIVERY, STORAGE AND HANDLING:

Delivery, storage and handling of the secondary containment materials shall conform to the manufacturer's recommendations and shall be done in such a manner as to prevent damage to any part of the work.

PROJECT/SITE CONDITIONS:

The purpose of this work is to install a system for secondary containment of decontamination and treatment water in the decontamination building for a duration of 30 years.

In general the secondary containment system under the concrete floor shall consist of the following beginning from the bottom of the system to the top of the system immediately under concrete:

- A prepared subgrade with no projections or sharp rocks
- An 8-oz/s.y non-woven geotextile fabric
- A 40 mil minimum HDPE geomembrane
- A geocomposite liner with a geonet sandwiched between two layers of geotextile
- A 6-inch minimum layer of clean concrete sand

Refer to Subcontract drawings for dimensions and layout of the secondary containment.

The building for the decontamination is located at the Idaho National Engineering and Environmental Laboratory (INEEL) in southeast Idaho. The mean temperature at this location is 42° F, with a summer high of 100° F, and a winter low of -40° F.

The highest recorded winds are 85 mph.

QUALITY CONTROL:

The installation Subcontractor shall be approved by the manufacturer of the secondary containment component materials. A representative of the company furnishing the containment materials shall be present during the entire installation procedure and shall provide technical assistance for the installation of the lining.

The Subcontractor shall be an established firm regularly engaged in manufacturing and installing liner systems for the past 5 years.

The Subcontractor shall provide documentation of an approved Subcontractor Quality Control Plan for the fabrication and installation of the liners.

Documentation shall be submitted with the liner certifying compliance with the Materials section of this specification.

WARRANTY:

Manufacturer shall provide a written 30-year prorated warranty on the components of the secondary containment system. The installation shall be warranted against defects in workmanship of components for a period of 2 years from the date of installation completion.

PART 2--PRODUCTS

MATERIALS:

The specifications for the secondary containment materials shall meet the physical requirements as follows:

NON-WOVEN GEOTEXTILE FABRIC

(Placed on the Prepared Subgrade)

Table 1. Non-Woven Fabric

Typical Properties	Test Method	Requirements
Grab Tensile Strength	ASTM D4632	160 lbs
Fabric Weight	ASTM D5261	8 oz/yd ³ min
Apparent Opening Size	ASTM D4751	100 sieve size mm
Water Flow Rate	ASTM D4491	110 gpm/ft ²

1 consistent with the requirements of the project drawings. These details shall include the
2 recommended termination details of the geomembrane and as shown on the plans.

3
4 All factory seams shall be made by thermal fusion methods. Fabricated seams found to have
5 less than the specified minimum overlap shall be repaired to have the minimum specified
6 overlap or will be rejected.

7
8 Inspection and Testing of Factory Seams: All sheets and seams shall be 100% visually
9 inspected during fabrication. No defective seams will be allowed. All indicated repairs shall
10 be made before the panels are packaged for shipment.

11
12 In addition to visual inspection, a 48-inch sample shall be taken from each factory seam-
13 welding unit used in this work at the beginning of every work shift and every four hours of
14 production thereafter. Samples shall be non-descriptive, i.e., will not require patching of
15 fabricated panels. Test specimens shall be cut at quarter points from each 48-inch seam
16 sample (a total of three places) and tested for factory seam strength and peel adhesion. The
17 shear seam strength shall be tested in accordance with ASTM D751 as modified in Annex A
18 of ANSI/NSF 54. The peel adhesion shall be tested in accordance with ASTM D413 as
19 modified in Annex A of ANSI/NSF 54.

20
21 A log shall be maintained showing the date, time, panel number and test results. Failure of
22 the material and seams to meet all the requirements of these specifications may be cause for
23 rejection of the HDPE material and seams as appropriate. The Subcontractor shall provide
24 the certified test results to the Contractor.

25
26 HDPE Panel Packaging and Storage: Each factory-fabricated panel shall be rolled and
27 placed into a sturdy container designed to be moved by a forklift or similar equipment. Each
28 panel shall be given prominent and unique identifying marking indicating the proper
29 direction of unrolling to facilitate layout and positioning in the field. The panels shall be
30 packaged in heavy cardboard or wood crates fully enclosed and protected to prevent damage
31 during shipment and each crate is to be prominently marked in the same fashion as the panels
32 within. Until needed, packaged factory fabricated panels shall be stored in their original
33 unopened crates in a dry area, and protected from the direct heat of the sun. Pallets should
34 not be stacked.

GEOCOMPOSITE

The geocomposite shall be manufactured by heat bonding needle punched, non-woven, continuous filament, polyester geotextiles to two sides of the HDPE geonet core

The geocomposite shall meet the minimum physical requirements indicated in Table 3, 4 and 5 below.

Table 3. Geocomposite Properties
(Geonet Core with Double Sided Fabric)

Property	Test	Units	Minimum TN3002/1128
Transmissivity ₁ (15,000 psf)	ASTM D 4716	M ₂ /sec	2.0×10^{-4} typical
Ply Adhesion	ASTM D 413 or F 904	Lb./in	2.0
Tensile Strength	ASTM D 4632	Lbs.	500

Component Properties (Tables 4 and 5)

Table 4. Minimum Physical Properties of the Geotextile Fabric

Typical Properties	Test Method	Requirements
Grab Tensile Strength	ASTM D4632	230 lbs
Fabric Weight	ASTM D5261	8 oz/yd ² min
Apparent Opening Size	ASTM D4751	70 sieve size mm
Water Flow Rate	ASTM D4491	90 gpm/ft ²
Puncture Resistance	ASTM D4833	100 lbs

Table 5. Minimum Physical Properties of the Geonet

Typical Properties	Test Method	Min. Requirements
Tensile Strength	ASTM D5035	32 lb/in
Transmissivity	ASTM D4716	1×10^{-3} m ² /sec@ 15,000 psf
Thickness	ASTM D5199	0.200 inches
Density	ASTM D1505	0.94 g/cc
Carbon Black Content	ASTM D4218	2%
Mass per Unit Area	ASTM D5261	0.140 lbs/ft ²

The geonet shall be designed and manufactured specifically for the purpose of containment of liquids. It shall be manufactured from new, first-quality resin and shall meet the minimum physical requirements indicated in the Physical Properties table (Table 5).

Known suppliers of the non-woven fabric, the membrane and the geocomposite materials are: Northwest Linings & Geotextile Products, Inc. (253-872-0244), Serrot International, Inc. (800-237-1777) and Familian Northwest (208) 234-1488.

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Boots for pipe penetrations shall be prefabricated and designed to fit site-specific conditions for the intended slope and size of the pipe. Boots shall be compatible with the geomembrane.

CONCRETE SAND

The concrete sand used to backfill over the geocomposite shall comply with fine aggregate of Section 03300 concrete.

PART 3--EXECUTION

PREPARATION:

The installation of the secondary containment system shall not begin until after a proper base has been prepared to accept the secondary containment components. The subgrade material shall be smooth and compacted material and free from sharp objects that could puncture the lining. All vegetation, roots and grass must be removed. Any cracks or voids shall be filled.

The subgrade surface shall be made uniform as per the plan drawings. Abrupt changes in elevation grade of the prepared surface is to be avoided. The surface shall be compacted in accordance with Division 2, Section "Earthwork" and shaped to comply with the manufacturer's recommendations.

Acceptance of the subgrade surface by the Contractor and liner manufacturer's representative is required before proceeding with the installation of the containment system. Direction and control of any subsequent repairs to the subgrade, including the subgrade surface, shall remain the responsibility of the Subcontractor. Subgrade acceptance by the Contractor does not constitute acceptance of construction variables, such as moisture content and compaction.

FACTORY QUALITY CONTROL:

Receiving Inspection: When the rolls of fabric, HDPE membrane and geotextile are received from the manufacturer, the roll numbers and production lot number given on the packing list shall be verified.

Rolls shall be inspected to assure rolls have not been visibly damaged during transit.

Random testing shall be done by the Contractor to assure that the lining delivered meets project specifications for gauge, roll width, taper, dimensional stability, and minimum tensile properties. Test results shall be compared with the minimum requirements established by NSF Standard 54.

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Fabrication and Inspection of Membrane: In order to minimize field-seaming requirements during installation, individual rolls of the liners shall be factory fabricated into large panels, to the greatest extent possible. Factory panels will be fabricated by heat welding. A 12-inch cross-sectional panel retainer shall be removed from each production run. This will be used for factory and field seam testing.

After the panel retains are cut, samples shall be tested for bonded seam strength (stress strength) and peel adhesion. All seam testing shall be performed as required by NSF Standard 54. Bonded seam strength tests for the liners shall be done in accordance with ASTM D6392 (as modified in NSF Standard 54). Peel adhesion test for the liners shall be conducted in accordance with ASTM D6392 (as modified in NSF Standard 54). All seam strength test reports shall be furnished to the Contractor.

INSTALLATION:

Prior to placing the secondary containment system, the subgrade shall be graded to drain to the drainage piping as shown on the plans. The fabric, HDPE membrane and geocomposite liners shall be placed on the subgrade as shown in the drawings and as recommended by the manufacturer.

NON-WOVEN FABRIC:

The non-woven fabric shall be handled in such a manner as to ensure it is not damaged. All work shall proceed from the side shown on the shop drawings in a uniform manner. In the presence of wind the fabric shall be weighted with sandbags or equivalent. The fabric shall be installed by overlapping each panel 4-6 inches. The overlap shall be tied in place with plastic ties at a rate of one tie every 5 feet. Ties shall be a contrasting color to the fabric. Ties shall not be metal. Fabric shall not be anchored to the concrete foundations with the membrane. All work shall be in accordance with the manufacturers recommendations.

HDPE GEOMEMBRANE:

The work of installing the 40-mil thick HDPE geomembrane shall be done in strict accordance with the project drawings, these specifications and Subcontractors approved shop drawings.

Sufficient material shall be furnished to cover all areas as shown on the drawings including seam areas, appurtenances as required. The installer of the liner shall allow for any anticipated or planned shrinkage or wrinkles in the field panels, installing the membrane free of stress or tension.

Installation: The HDPE geomembrane shall be placed over the prepared surfaces and woven fabric in such a manner as to insure minimum handling and in accordance with the approved shop drawings. The lining shall be sealed to all concrete structures and other openings in accordance with details shown on the plans and shop drawings. The geomembrane lining shall be closely fitted and sealed around all inlets, outlets, and other projections through the

lining, using prefabricated fittings. Liner sheets, damaged from any cause, shall be removed, repaired or covered with additional sheeting.

The liner shall be attached to the concrete foundation with a butyl rubber sealant, a continuous 2" x 1/4" neoprene gasket, and a stainless steel flat bar as shown on the plans. Details shall be submitted on the shop drawings. Special attention shall be given to all field seams especially around the concrete structures and pipe penetrations to assure water tightness.

Stainless steel shall comply with ASTM 276 and ASTM A240.

The butyl rubber sealant is a one-part grade caulking, sealing and glazing compound formulated from virgin butyl rubber, normigrating plasticizers and chemically stable fillers. Apply by caulking gun or pressure equipment. A known manufacturer of this sealant is:

PECORA CORP.
 165 Wambold Road
 Harleysville, PA 19438
 (215) 723-6051

Field Welding: Seams can be made by extrusion or hot wedge welding. The primary method of welding shall be double wedge welding with extrusion welding used for repairs and detailing. The machine shall be set to the predetermined temperature and speed. A trial seam shall then be run and tested to verify these settings before welding on the membrane is started. The machine settings shall be adjusted accordingly. Extrusion and single wedge seams shall have a nominal six-inch overlap and a nominal two-inch bond. Dual wedge seams shall have a nominal six-inch overlap and two half-inch wide bonds separated by a one-inch air channel.

Extrudate shall be made from the same resin as the geomembrane, and shall be free of contamination by moisture or foreign matter. Additives shall be thoroughly dispersed in the extrudate. The Subcontractor shall test the resin for the following properties:

Properties	Test Method	Test Frequency
Density	ASTM D792/D1505	1 per Resin Batch
Melt Flow Index	ASTM D1238	1 per Resin Batch
Carbon Black Content	ASTM D1603/D4218	1 per Resin Batch

Results from testing shall be submitted to the Contractor.

Seams shall be welded only when ambient temperatures are between 32° F and 110° F as measured six inches above the geomembrane surface. However, temperature is of less concern to good seam quality than is moisture. For cold weather seaming, it is advisable to preheat the sheets with a radiant heater, or a hot air blower, or to use a tent in order to determine appropriate seaming conditions. No welding shall take place when it is snowing, sleeting, or raining.

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1 Visual Inspection: After welding, a close visual inspection of the seams shall be made. This
2 is to be done as soon as possible after the weld has been completed. The inspection is to
3 include weld alignment.
4

5 Defective areas shall be marked and repaired. This inspection/repair process is to be carried
6 out in a systematic manner as soon as possible to ensure that no defective area goes
7 unrepaired.
8

9 Non-Destructive Seam Strength Testing: The Subcontractor shall perform non-destructive
10 seam testing of all field seams over their full length using vacuum box testing, air pressure
11 testing (for fusion wedge welded seams only), or spark testing.
12

13 Destructive Seam Strength Testing: Destructive testing may be allowed per manufacturers
14 direction.
15

16 Vacuum Box Testing: The equipment shall include two vacuum box assemblies consisting
17 of the following: a rigid housing, a transparent viewing window, a soft neoprene gasket,
18 attached to the bottom, a port hole or valve assembly, a vacuum gauge, a vacuum device
19 equipped with pressure control, a rubber pressure/vacuum hose with fittings and connections,
20 a soapy solution and an applicator.
21

22 Testing shall conform to the following procedure: brush a soapy solution on the
23 geomembrane. Place vacuum box over the wetted seam area. Ensure that a leak-tight seal is
24 created. Apply a vacuum of approximately 5-psi. Examine the geomembrane through the
25 viewing window for the presence of soap bubbles for not less than ten seconds. All areas
26 where soap bubbles appear shall be marked and repaired as described in this section.
27

28 Air Pressure Testing (for fusion wedge welded seams): The equipment shall consist of the
29 following: an air pump (manual or motor driven) equipped with pressure gauge capable of
30 generating and sustaining pressures over 35 psi and mounted on a cushion to protect the
31 geomembrane, a rubber hose with fittings and connections, a sharp hollow needle, or other
32 approved pressure feed device, and a pressure gauge.
33

34 Testing shall conform to the following procedure: seal both ends of the seam to be tested.
35 Insert needle or other approved pressure-feed device into the channel created by the double-
36 wedge weld. Energize the air pump to a minimum of 25 psi but no greater than 30 psi, close
37 the valve and sustain the pressure for at least five minutes. If pressure loss exceeds 3 psi or
38 does not stabilize, locate faulty area and repair as described in this section. Puncture
39 opposite end of the seam to release air. If blockage is present, locate and test seam on both
40 sides of blockage. Remove needle or other approved pressure-feed device and seal
41 penetration holes by extrusion welding as necessary.
42

43 Spark Testing: The spark test method consists of introducing 24 gauge copper wire placed at
44 the edge or just under the top sheet overlap of the two sheets, prior to the welding with the
45 extruder. After welding, a spark detector, operating at 20,000 volts, is run along the weld. If
46 any pinholes are present, a circuit will be completed through the copper wire and the spark

1 detector. This will sound an alarm in the detector alerting the operator the presence of a
2 defective area. The spark test is typically used for extrusion welded seams where there is no
3 hazard anticipated from a spark and where there is no chance of creating a vacuum seal.
4 The spark detector should not be used in the presence of water or excessive moisture. There
5 is no immediate danger to human or animal life if a circuit is made through the spark
6 detector.

7
8 Joins to Structures: The HDPE geomembrane liner shall be sealed to all concrete structures
9 and other openings through the lining with a butyl rubber sealant and in accordance with
10 details shown on the plans and approved shop drawings.

11
12 Factory and field fabricated pipe boots shall be used to seal all pipes penetrating the liner.
13 All joints shall be tightly bonded.

14
15 Defects and Repairs: The geomembrane shall be examined for defects, holes, blisters,
16 undispersed raw materials, and any sign of contamination by foreign matter. The
17 geomembrane surface shall be clean at the time of examination. Each suspect location shall
18 be repaired and non-destructively tested.

19
20 Damaged geomembrane shall be removed and replaced with the same membrane type if
21 damage cannot be satisfactorily repaired.

22
23 Any portion of the geomembrane exhibiting a flaw or failing a non-destructive test shall be
24 repaired. Procedures available include:

- 25
26 - Patching: Used to repair large holes (over 3/8" diameter) and tears (over 2" long), and
27 contamination by foreign matter.
28 - Abrading and re-welding: Used to repair small seam sections (less than 12" long).
29 - Spot welding: Used to repair small tears (less than 2" long), pinholes, or other minor
30 localized flaws.
31 - Capping: Used to repair large lengths of failed seams.
32 - Removing: Removing the unsatisfactory material or seam and replacing with new
33 material.

34
35 Patches or caps shall extend at least 6" beyond the edge of the defect, and all corners of
36 material to be patched shall be rounded to a radius of at least 3".

37
38 Repairs shall be non-destructively tested using methods specified in this section.

39
40 Preparation of Concrete Surfaces: Concrete surfaces which are to be lined shall have all
41 rough edges and projections removed in the area of the lining. All cracks in the concrete
42 shall be cleaned and filled with a sand-cement mortar or approved system prior to
43 application. Extruded expansion joint material and joint sealers shall be cut off flush. The
44 entire surface to be lined shall be smoothed and cleaned of all foreign materials and swept
45 thoroughly.

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1 Place load ballast on the geomembrane, which will not damage liner to prevent wind uplift.
2 Number, size and spacing shall be under the strict recommendation of the liner manufacturer
3 and shall be detailed on the shop drawings. Polypropylene bags shall be filled with sand.
4 Paper bags are not permitted.

5
6 GEOCOMPOSITE:
7

8 The geocomposite (geotextile/geonet) shall be installed over the geomembrane as shown on
9 the plans and as directed. The geocomposite shall be installed by overlapping each panel
10 approximately 4-6 inches. The overlap shall be tied in place with plastic ties at a rate of one
11 tie every 5 feet. Ties shall be a contrasting color to the geotextile/geonet.

12
13 When connecting rolls end to end, the net shall be overlapped one foot and tied every
14 12 inches across the roll. Metallic devices are not allowed.

15
16 The geocomposite shall be placed over the geomembrane in such a manner as to assure
17 minimum handling. The Subcontractor shall be responsible for surveying to control the
18 location and placement of the liners.

19
20 The geocomposite shall be secured in place in such a manner as to continually keep the
21 geocomposite sheet in sufficient tension to reduce folds and wrinkles.

22
23 In the presence of high wind, the geocomposites shall be weighted with sandbags or the
24 equivalent. The geocomposite shall be cut using an approved cutter. If the material is being
25 cut in place, special care must be taken to protect other geosynthetic materials from damage.

26
27 Care shall be taken to not entrap excessive dust or soil that could damage the geocomposite
28 or geomembrane, or generate clogging of drains.

29
30 CONCRETE SAND:
31

32 The concrete sand shall be placed and compacted to the lines and grades shown on the plans.
33 Placement of the sand shall proceed from one side of the building and be spread and
34 compacted uniformly across the floor area. Special care shall be used in the placement,
35 watering and compaction of the sand to avoid compromising the containment liner
36 components underneath and adjacent to the concrete foundations

37
38 Prior to placing the segments of the concrete floor the sand shall be moistened and
39 recompact to provide a uniform surface for the concrete floor. Continuous care and
40 precautions shall be taken to avoid damage to the liner, anchorage and liner components
41 during the placement of the sand and concrete.

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1 FIELD QUALITY CONTROL:

2

3 Surveillance will be performed by the Contractor's Representative to verify compliance of
4 the work to the drawings and specifications.

5

6 END OF SECTION 02598

SECTION 02713--UNDERGROUND POTABLE AND RAW WATER SYSTEM

PART 1--GENERAL

SUMMARY:

The Subcontractor shall furnish and install all equipment, materials and supplies and perform all work and operations necessary to furnish and install the underground potable water (CW) and raw water (RW) piping system and appurtenances to complete the work as shown on the Subcontract drawings and specified herein. Underground piping includes all piping, fixtures, and fittings starting 6" above the finished floor and below, including all piping inside underground trenches and utility tunnels.

Work includes, but is not limited to:

Furnish and install all valves, tubing, pipe, supports, thrust blocks and appurtenances as required to complete the work as shown on the subcontract drawings for the potable water system and raw water system.

REFERENCES:

The following documents, including others referenced therein, form part of this Section to the extent designated herein and must be complied with:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|------------|--|
| ASTM B62 | Standard Specifications for Composition Bronze or Ounce Metal Castings |
| ASTM D1784 | Standard Specification for Rigid Polyvinyl Chloride Compounds |
| ASTM D3139 | Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals |
| ASTM D3350 | Standard Specifications for Polyethylene Plastic Pipe and Fittings Material |
| ASTM D3915 | Standard Specification for Rigid Poly Vinyl Chloride (PVC) Compounds for Plastic Pipe Fittings Used in Pressure Applications |

AMERICAN WATER WORKS ASSOCIATION (AWWA)

- | | |
|------------|---|
| AWWA A605 | Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water |
| AWWA C509 | Resilient-Seated Gate Valves for Water Supply Service |
| AWWA C 651 | Standard Specifications for Disinfecting Water Mains |
| AWWA C800 | Underground Service Line, Valves and Fittings |
| AWWA C900 | Polyvinyl Chloride (PVC) Pressure Pipe, 4"-12" for Water Distribution |

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AWWA C 906 Polyethylene (PE) Pressure Pipe and Fittings, 4" through 63", for
Water Distribution

NATIONAL ASSOCIATION OF CORROSION ENGINEERS (NACE)

NACE MR0274 Standard Material Requirements for Polyolefin Cold-Applied
Tapes for Underground or Submerged Pipeline Coatings
NACE RP0188 Discontinuity (Holiday) Testing of Protective Coatings

IDAHO STATE REGULATIONS

IDAPA 58.01.08.550 Idaho Regulations for Public Drinking Water Systems
1997 Recommended Standards for Water Works (10-State)

NSF INTERNATIONAL

Drinking Water Components – NSF 61 Standard

INTERNATIONAL ASSOCIATION OF PLUMBING & MECHANICAL OFFICIALS
(IAPMO)

UMC (1997) Uniform Mechanical Code
UPC (2000) Uniform Plumbing Code for Potable Water

ASME CODE FOR PRESSURE PIPING

ASME B31.3 Pressure Piping for Raw Water

SUBMITTALS:

Submittals include, but are not limited to the following:

Procedures: The Subcontractor shall submit installation and fusion procedures for HDPE pipe.

Product Data: Subcontractor shall submit catalog data for all pipe and fittings specified in this section.

Test Procedures: The Subcontractor shall submit a hydrostatic test procedure and a detailed job specific flushing procedure. The flushing procedure shall outline where the flushing water will be obtained and how it will be disposed of in a safe manner. It shall also outline how the flow will be monitored to assure adequate flow and how long the flow must be maintained to adequately flush the piping. This procedure must be submitted for review prior to any connections to existing plant piping.

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Certifications: A Contractor's Material and Test Certificate for Under-Ground Piping shall be completed and accepted for each major portion of the work covered by this specification prior to final acceptance of the installation.

Sterilization: The Subcontractor shall submit a sterilization procedure for approval for the potable water system.

Maintenance Manuals: Submit maintenance and operation manuals with complete parts lists for all valves and assemblies.

See Section 01300, Submittals and the Vendor Data Schedule for additional submittal requirements.

QUALITY CONTROL:

Regulatory Requirements (Codes and Standards): Comply with the provisions of the following codes and standards, unless otherwise specified herein:

AWWA
UPC
IDAPA 58.01.08.550

PART 2--PRODUCTS

GENERAL:

All materials, products and equipment shall be as manufactured by the manufacturer specified in this section.

PIPE AND FITTINGS:

High Density Polyethylene (HDPE) Piping and Fittings:

Service: Potable water, underground less than 6-in. diameter.

Encasement: The 6" encasement piping shall be HDPE SDR 17, 100-psi minimum, in accordance with AWWA C906.

Piping: Potable water piping shall be High Density Polyethylene (HDPE) SDR 11.0, 160-psi minimum, in accordance with AWWA C906.

Fittings: Potable water valves and fittings shall be HDPE SDR 11.0, 160-psi minimum, in accordance with AWWA C906. Valves for potable water shall be Clow, F-6100 and shall be in compliance with AWWA C509 Standard.

Polyvinyl Chloride (PVC) Piping and Fittings:

Service: Raw water, underground.

Piping: Raw water piping shall be PVC AWWA C900. 6" – 12" for water distribution.
Raw water piping shall be HDPE AWWA C901. 2" - 3" for raw water service.

Fittings: Raw water fittings shall comply with ASTM D3915 – Standard Specification for Rigid Polyvinyl Chloride (PVC) Compounds for Plastic Pipe Fittings used in Pressure Applications. Raw water fittings shall comply with ASTM C906 for HDPE pipe fittings used in pressure applications.

Ball Valves: Raw water valves shall be PVC, SW, True Union Type. Bronze or iron body valves may be used.

FIXTURES, FITTINGS AND TRIM:

Products shall be as listed below.

Identification Ribbon (GFE): Identification ribbon shall be 3-in. minimum wide, with a message printed on the ribbon that identifies the actual pipeline contents.

The plastic ribbon shall be color coded in conformance with the following:

<u>Pipeline Contents</u>	<u>Tape Color</u>	<u>Lettering Color</u>
Raw Water	White	Green
Potable Water	Green	White

Locator Ribbon: See Section 02200, Earthwork.

PART 3--EXECUTION

ACCESSIBILITY:

Items such as valves, controls, access doors, specialties, and accessories shall be installed so as to be readily accessible for operation, servicing, maintaining and repairing.

PIPELINES:

Pipe shall be bedded in sand, insulation or other approved material, 4-in. minimum in all directions.

Install pipe to uniform pitches between points for which elevations are established. Provide bends or elbows for changes in directions. One-quarter bends shall be long sweep type.

Between bends or elbows, lines shall be straight, free from irregularities, and have smooth interior surfaces. Reducers shall be required for changes in the size of pipes and fittings. Bushings shall not be used.

Anchorage against slippage shall be provided by means of concrete thrust blocks, tie rods and pipe clamps, or other approved means. Joints shall be made accessible for inspection and repair prior to testing and backfilling.

PIPE SLEEVES:

Install standard weight pipe sleeves for pipes passing through job cast concrete and masonry walls. Diameters of sleeves shall not be larger than required for unrestricted expansion and contraction. Length of sleeves shall be such that when installed, they will project 2 in. above floors, and be flush with finished surfaces of walls and ceilings.

PIPE JOINTS:

HDPE Pipe Joints: HDPE pipe and fittings shall be joined by the heat fusion process. Joints shall be made in accordance with manufacturer's requirements.

PVC Pipe Joints: PVC pipe joints shall be made in accordance with manufacturer's requirements.

Pipe Tie-Ins: When performing final tie-ins to existing or new piping which requires cutting, grinding, drilling or other operations and may introduce dirt, chips, or debris into the pipe interior, expanding pipe plugs shall be installed in the pipe where possible to prevent contamination spread. These plugs shall be equipped with lanyards, which extend outside the pipe end to prevent the plug from being inadvertently left in the pipe. No other objects such as rags, cardboard, paper, etc., shall be used in lieu of these plugs. Where it is not possible to install pipe plugs, the Subcontractor shall prepare a work plan that describes how cleanliness shall be maintained. This plan shall be approved by the Contractor.

PIPE IDENTIFICATION:

Identification Ribbon: All underground piping shall be wrapped with Identification Ribbon. All existing underground piping uncovered during construction shall be identified and wrapped with Identification Ribbon to the extent of the excavation. The ribbon shall be wrapped around the pipeline at no less than 1 wrap per 3 ft of run, with the pipe identification label showing.

Locator Ribbon: See Section 02200, Earthwork.

EQUIPMENT, FIXTURES, ETC.:

Fixtures shall be installed and supported in a safe, rigid, neat, and orderly manner. They shall be free from undue stresses and made suitable for normal use.

1 All of the above shall be protected from damage during and after installation. At completion,
2 work shall be free from tool marks, discolorations, cracks, scratches, chips and other defects.

3
4 POTABLE WATER SEPARATION:

5
6 Potable water lines includes only potable water (CW). Utility lines include fire water (FW)
7 and raw water (RW). Process lines shall include all other process, waste, sanitary, and
8 service lines.

9
10 Potable water lines may be installed in a common trench with fire water and raw water. The
11 minimum horizontal separation is one foot measured between the two closest outside walls of
12 the potable water and the fire water and the raw water.

13
14 The bottom of the water pipes is to be 12-in. above the top of the nonpotable water pipes
15 unless basalt rock is encountered. In no case shall the potable line be deeper than the
16 nonpotable line.

17
18 The potable pipe is to be placed on a solid shelf excavated on one side of the trench or on fill
19 compacted to 95% of maximum dry density.

20
21 Potable water lines shall be separated from wastewater, sewer and process lines by a
22 minimum of 10 ft. horizontally, or separated by 6 ft. horizontally and 18 in. vertically and
23 the process line shall be constructed, as a minimum, to the requirements of the water line, or
24 encased in 4" minimum of concrete all around, or double encased in welded Sch. 40 CS or
25 polyethylene pipe sealed at both ends. See plans for specific details.

26
27 FIELD QUALITY CONTROL:

28
29 Test of Piping System: All new underground raw water system piping shall be
30 hydrostatically tested at not less than 175-psi pressure for two hours.

- 31
32 1. Slowly fill with water each section of the main to be tested.
33 2. Expel all air by opening at both ends, or by bleeding air through temporary
34 valves.
35 3. Open wide the valve controlling the admission of water before shutting the drains.
36 4. After the system has been filled with water and the entrapped air expelled, close
37 the valve controlling the section being tested and begin applying pressure.
38 5. Increase the water pressure to 50-psi increments until the specified test pressure is
39 attained.
40 6. After each increase in pressure, make observations of the stability of the joints. In
41 these observations, include such items as protrusion or extrusion of the gasket,
42 leakage or other factors likely to affect the continued use of a pipe in service.
43 7. During the test increase the pressure to the next increment only after the joint has
44 been determined to be stable. This applies particularly to movement of the
45 gasket.

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1 8. After the pressure has been increased to the maximum value and held for one hour
2 with no loss in pressure, decrease the pressure to 0 psi while observing for
3 leakage. Then slowly increase the pressure to the specified maximum and hold
4 the pressure for one more hour.

5

6 Testing and Flushing shall be witnessed by the Contractor's Representative.

7

8 Prior to covering the pipe, the Contractor shall have an Engineer registered in the State of
9 Idaho, inspect and certify that the installation is proper and is in compliance with these
10 procedures.

11

12 HDPE potable water pipe shall be tested in accordance with Section 02733.

13

14 STERILIZATION OF POTABLE WATER LINE:

15

16 The sterilization of the potable water line shall be in accordance with Section 15480 of these
17 specifications and shall be witnessed by the Contractor's Representative.

18

19 CLEANING:

20

21 Flushing of Piping: New underground mains and lead-in connections shall be flushed
22 thoroughly immediately after tie-in to system is made.

23

24 Flush underground mains through hydrants at dead ends of the system or through accessible
25 aboveground flushing outlets allowing the water to run until clear and move any foreign
26 material out of the piping.

27

28 The Subcontractor shall provide splash blocks to avoid scour and erosion when removing the
29 test water from the pipe.

30

31 END OF SECTION 02713

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SECTION 02722--SANITARY SEWER SYSTEM

PART 1--GENERAL

SUMMARY:

The Subcontractor shall furnish and install all equipment, materials, and supplies and perform all work and operations necessary for furnishing and installing the sanitary sewer piping and appurtenances complete as shown on the subcontract drawings and specified herein.

Work includes, but is not limited to:

Furnish and install sanitary sewer piping, pumps, fixtures, and accessories as shown on the subcontract drawings and as specified herein.

REFERENCES:

The following documents, including others referenced therein, form part of this Section to the extent designated:

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.21 Non-Metallic Flat Gaskets for Pipe Flanges

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D1248 Standard Specification for Polyethylene Plastics Molding and Extrusion Materials

ASTM D3034 Standard Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings

ASTM D3212-RevA Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

ASTM F714 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

IDAHO STATE REGULATIONS

1997 RECOMMENDED STANDARDS FOR WASTEWATER FACILITIES

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INTERNATIONAL ASSOCIATION OF PLUMBING & MECHANICAL OFFICIALS
(IAPMO)

UMC (1997) Uniform Mechanical Code
UPC (2000) Uniform Plumbing Code

NATIONAL ELECTRICAL CODE (NEC)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) NFPA 70

SUBMITTALS:

Submittals include, but are not limited to the following:

Procedures: The Subcontractor shall submit installation and fusion procedures for HDPE pipe.

Warranty: Submit written warranty for the pumps.

Test Procedures: The Subcontractor shall submit a hydrostatic test procedure and a detailed job specific flushing procedure. The flushing procedure shall outline where the flushing water will be obtained and how it will be disposed of in a safe manner. It shall also outline how the flow will be monitored to assure adequate flow and how long the flow must be maintained to adequately flush the piping. This procedure must be submitted for review prior to any connections to existing plant piping.

Certifications: A Contractor's Material and Test Certificate for Under-Ground Piping shall be completed and accepted for each major portion of the work covered by this specification prior to final acceptance of the installation.

Maintenance Manuals: Submit maintenance and operation manuals with complete parts list for all valves and assemblies.

Product Data: Submit catalog data, specifications, and as-built drawings for piping and equipment furnished including fiberglass basins and the submersible guide pumps.

See Section 01300, Submittals and the Vendor Data Schedule for additional submittal requirements.

QUALITY CONTROL:

Codes and Standards: Comply with the requirements of the current revision of the following codes and standards, as specified in this specification:

UPC

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1 WARRANTY:

2
3 The pump unit or any part thereof shall be warranted against defects in material or
4 workmanship within one year from date of installation and shall be replaced at no charge
5 with a new or manufactured part, F.O.B factory or authorized warranty service station.
6

7 PART 2--PRODUCTS

8
9 GENERAL:

10 All material, products, and equipment shall be manufactured as specified in this section.
12

13 PIPE AND FITTINGS:

14
15 High Density Polyethylene (HDPE) Piping and Fittings:

16
17 Service: 2" – 4" Sanitary Waste Water (WQ)

18
19 Piping: Piping shall be 100-psi minimum, HDPE SDR 17.0, as manufactured by
20 Plexco, Drisco or CSR.

21
22 Fittings: Fittings shall be 100-psi minimum, HDPE, ends suitable for butt-fusion, UL
23 Listed, per ASTM F 714 and D 3350.

24
25 Flanges: Flanges shall be slip-on (flat metal plate) 304 SST, 150 psi Plexco in
26 accordance with ANSI B16.21.

27
28 Bolts: Bolts shall be SST, ASTM A 193, Grade B8, and Galling Resistant Nitronic 60
29 nuts, ASTM A 194, Grade 8S (UNS S21800).

30
31 Polyvinyl Chloride (PVC) Sewer Pipe and Fittings:

32
33 Service: 8" gravity sanitary sewer.

34
35 Piping: SDR 35 PVC sanitary. ASTM D3034.

36
37 Gasketed Joints: ASTM D3212-RevA.

38
39 VALVES:

40
41 Gate Valves (Under Ground): The Gate Valve shall consist of an encapsulated disc with
42 elastomer seat which, in the closed position, effects a seal upon a cast iron body resulting in a
43 bubble tight seal across this disc at a full differential of 200 psi. This shall be accomplished
44 by means of a corrosion resistant threaded bronze stem, acting through a bronze stem nut,
45 fixed into the disc in such as to force the disc seat into the body, affecting a seal when the
46 stem is torqued in the desired direction. Each valve shall be tested from both directions, by

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the manufacturer, for bubble tight, 200-psi differential sealing ability. Each valve shall also be tested in the "disc up" position at 400 psi resulting in a full shell test. There shall be no leakage at any of the valve's joints or connections. All internal parts shall be accessible without removing the main body from the pressure line. All cast iron internal surfaces of the body shall be coated completely with a corrosion resistant coating. This Resilient-Sealed Gate Valve shall conform to AWWA Standard C-509 latest revision. The internal diameter of the water passageway shall be at least as large as the connecting pipe inside diameter. Valves shall be non-rising stem, 2-in. hub nut with key, Clow Valve Co. or Kennedy Valve Co.

Gate Valves: (Lift Station): The gate valves in the lift station shall be bronze and shall be manufactured by Stockman Valve Co.

Check Valves (Lift Station): The check valves for the lift station shall be as manufactured by AK Industries or GA Industries.

Check Valves (Quick Disconnect Line): The 2" check valve for the quick disconnect line shall be manufactured by Clow Valve Co.

Hand Operated Valve (1" Quick Disconnect): The hand operated stainless steel valve for the 1" quick disconnect valve shall be manufactured by Clow Valve Co.

SUBMERSIBLE GRINDER PUMPS:

The Subcontractor shall furnish all labor, materials, equipment, pump basin, pump power cables, ultrasonic level controls and incidentals required to provide three explosion-proof submersible centrifugal sewage grinder pumps for NEC class 1, division 1, group C, D hazardous locations. Two pumps shall be installed in the sanitary sewer lift station, and one pump shall be kept as an extra for maintenance and rotation purposes.

The Subcontractor shall supply a control panel, which contains all necessary components for proper starting and operation of the pump including control power transformer and flashing trouble light. This panel shall provide a circuit that monitors the seal sensors, heat sensors in the pump. Pump wiring shall be in accordance with Section 16120.

Each pump shall be equipped with stainless steel nameplate stating the unit is accepted for use in NEC Class 1, division 1, group C, D, hazardous locations with third party (Factory Mutual) approval.

Each pump shall be rated 2 HP, 460 volts, 3 phase, 60 hertz, 3450 RPM. The unit shall produce 25 GPM at 36-ft. THD, with a maximum input KW of 2.3 KW.

The pump shall be a centrifugal, submersible, grinder, wastewater type, model GILX 200CD as manufactured by Hydromatic Pumps. The pump volute, motor and seal housing shall be high quality gray cast iron, ASTM A-48, Class 30. The pump discharge shall be fitted with 1 1/4" NP flange. All external-mating parts shall be machined and Buna N Rubber O-ring

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1 sealed on a beveled edge. Gaskets shall not be acceptable. All fasteners exposed to the
2 pumped liquids shall be 300 series stainless steel.

3
4 Each pump shall have a 25' stainless steel 3/16" chain to raise the pumps for maintenance.

5
6 FIBERGLASS BASIN SPECIFICATION:

7
8 General: Unless otherwise indicated, the plastics terminology used in this standard shall be
9 in accordance with the definitions given in American Society for Testing and Materials
10 (ASTM) designations D883-69.

11
12 MATERIALS:

13
14 Laminate: The laminate shall consist of an inner surface, an interior layer and an exterior
15 layer of laminate body.

16
17 Inner Surface: The inner surface shall be free of cracks and crazing with a smooth finish.
18 This may be a gelcoat surface or reinforced with glass surface veil.

19
20 Interior Layer: A minimum of 0.100 inch of the laminate next to the inner surface shall be
21 reinforced with not less than 20 percent nor more than 30 percent by weight of
22 noncontinuous glass strands having fiber lengths from 0.5 to 2.0 inches.

23
24 Exterior Layer: The exterior layer of body of laminate shall be of construction suitable for
25 the service intended and contain sufficient glass by weight to provide the aggregate strength
26 necessary to meet the tensile and flexural requirements. The exterior surface shall be
27 relatively smooth with no exposed fibers or sharp projections. Hand work finish is
28 acceptable, but enough resin shall be present to prevent fiber show.

29
30 Tank Wall: Must be designed to withstand wall collapse based on the assumption that
31 saturated soil exerts hydrostatic pressure of 120 pounds per cubic foot. The tank wall
32 laminate must be constructed to withstand or exceed two times the actual imposed loading on
33 any depth of basin. Stress calculations must be submitted verifying the results obtained using
34 120 pounds per cubic foot hydrostatic pressure and two times actual imposed loading on any
35 depth basin. Depth of bury to be specified on purchase order with wall thickness calculated
36 and guaranteed by the supplier.

37
38 Tank Bottom: Must be constructed suitable for the service designated on the plans and these
39 specifications. Under totally water submerged conditions, the center deflection of any empty
40 tank bottom must be less than 3/8 inch as not to interfere with bottom pump mounting
41 requirements and rail systems.

42
43 Appearance: The finished laminate shall be as free as commercially practicable from visual
44 defects such as foreign inclusions, dry spots, air bubbles, pin-holes, dimples and
45 delaminations.

Basin: The pump basis shall be constructed of fiberglass. The bottom of the basin shall be reinforced with a fiberglass plate extending beyond the basin diameter for anchoring to a concrete pad. Pump mounting studs will be attached to this plate and installed in pump basin.

An easy out stainless steel rail system shall be installed in the basin as a means to remove the pumps. A pitless adapter shall be used to connect the pump to the effluent pipe.

FIXTURES, FITTINGS AND TRIM:

Products shall be of the manufacturers listed below:

Identification Ribbon (GFE): Identification ribbon shall be 3-in. minimum wide, with a message printed on the ribbon that identifies the actual pipeline contents.

The plastic ribbon shall be color coded in conformance with the following:

<u>Pipeline Contents</u>	<u>Tape Color</u>	<u>Lettering Color</u>
Sanitary Waste	Brown	White

Locator Ribbon: See Section 02200, Earthwork.

PART 3--EXECUTION

PIPELINES:

Pipe shall be bedded in sand, 4-in. minimum in all directions.

Install pipe to uniform pitches between points for which elevations are established. Provide bends or elbows for changes in directions. One-quarter and one-half bends shall be long sweep type.

Between bends or elbows, lines shall be straight, free from irregularities, and have smooth interior surfaces. Reducers shall be required for changes in the size of pipes and fittings. Bushings shall not be used.

Anchorage against slippage shall be provided by means of concrete or masonry piers, tie rods and pipe clamps, or other approved means. Joints shall be made accessible for inspection and repair prior to testing and backfilling.

Pipe shall be laid accurately to the line and grade shown on the drawings. As the work progresses, the interior of the sewer shall be cleared of all superfluous materials.

Pipelines shall be installed in a neat and orderly manner. Installation shall avoid interference with work of the other trades.

HDPE Pipe Joints: Butt-fusion joints shall be made in accordance with the manufacturer's requirements for joining pipe lengths. Mechanical flange joints for valve connections shall be made in accordance with manufacturer's requirements. Flange faces shall be 1/5 times the pipe thickness. Backing rings shall be properly tapered to fit behind HDPE flange faces. Tees shall be connected using no less than two mechanical joints (no more than one butt-fusion joint). Refer to the INEEL Weld Manual Section 2 (19.0 Bonding of Nonmetallic Components).

Pipe Tie-Ins: When performing final tie-ins to existing or new piping which requires cutting, grinding, drilling or other operations and may introduce dirt, chips or debris into the pipe interior, expanding pipe plugs shall be installed in the pipe where possible to prevent contamination spread. These plugs shall be equipped with lanyards, which extend outside the pipe end to prevent the plug from being inadvertently left in the pipe. No other objects such as rags, cardboard, paper, etc., shall be used in lieu of these plugs. Where it is not possible to install pipe plugs, the Subcontractor shall prepare a work plan, which describes how cleanliness shall be maintained. This plan shall be approved by the Contractor.

PIPE IDENTIFICATION:

Identification Ribbon: All underground piping shall be wrapped with Identification Ribbon. All existing underground piping uncovered during construction shall be identified and wrapped with Identification Ribbon to the extents of the excavation. The ribbon shall be wrapped around the pipeline at no less than 1 wrap per 3 ft of run, with the pipe identification label showing.

Locator Ribbon: See Section 02200, Earthwork.

POTABLE WATER SEPARATION:

Potable water lines include only potable water (CW). Utility lines includes fire water (FW), raw water (RW). Process lines shall include all other process, waste, sanitary, and service lines.

Potable water lines may be installed in a common trench with fire water and raw water. The minimum horizontal separation is one foot measured between the two closest outside walls of the potable water and the fire water and the raw water. See Section 02713 for other requirements.

Potable water lines shall be separated from sewer and process lines by a minimum of 10-ft. horizontally, or separated by 6-ft. horizontally and 18-in. vertically and the process line shall be constructed, as a minimum, to the requirements of the water line, or encased in 4: minimum of concrete all around, or double encased in welded Sch. 40 CS or polyethylene pipe sealed at both ends.

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1 FIELD QUALITY CONTROL:
2

3 Surveillance will be performed by Contractor's Representative to verify compliance of the
4 work to the drawings and specifications.
5

6 CLEANSING AND TESTING:
7

8 All piping systems shall be cleaned as specified in Section 02713 and shall be tested as
9 specified in Section 02733 of this Specification, and shall be witnessed by the Contractor's
10 Representative.
11

12 Hydrostatic Test: The leakage exfiltration or infiltration for the gravity sewers shall not
13 exceed 200 gallons per inch of pipe diameter per mile per day for any section of the system.
14 An exfiltration or infiltration test shall be performed with a minimum positive head of 2-feet.
15 Sewer pressure mains shall be tested in accordance with Section 02733.
16

17 The Subcontractor shall provide splash blocks to avoid scour and erosion when removing the
18 test water from the pipe.
19

20 Prior to covering the pipe, the Contractor shall have an Engineer registered in the State of
21 Idaho, inspect and certify that the installation is proper and is in compliance with these
22 procedures.
23

24 END OF SECTION 02722

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SECTION 02732--DECONTAMINATION WATER PIPING AND PUMPING SYSTEM

PART 1--GENERAL

SUMMARY:

The Subcontractor shall furnish and install all equipment, materials, and supplies and perform all work and operations necessary for furnishing and installing the decontamination water piping and appurtenances complete as shown on the subcontract drawings and specified herein.

Section Includes: Work includes, but is not limited to:

Furnish and install decontamination water piping, pumps, fixtures, and accessories as shown on the subcontract drawings and as specified herein.

REFERENCES:

The following documents, including others referenced therein, form part of this Section to the extent designated:

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.21 Non-Metallic Flat Gaskets for Pipe Flanges

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A193 Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service

ASTM A194 Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service

ASTM D1248 Standard Specification for Polyethylene Plastics Molding and Extrusion Materials

ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

ASTM F714 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

AMERICAN WATER WORKS ASSOCIATION (AWWA)

INTERNATIONAL ASSOCIATION OF PLUMBING & MECHANICAL OFFICIALS
(IAPMO)

UMC (1997) Uniform Mechanical Code

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ASME CODE FOR PRESSURE PIPING

ASME B31.3 For Decontaminization Water

NATIONAL ELECTRICAL CODE (NEC)

NATIONAL FIRE PROTECTION ASSOCIATION

NFPA 70

SUBMITTALS:

Submittals include, but are not limited to the following:

Product Data: Submit catalog data, specifications, and as-built drawings for piping and equipment furnished.

Procedures: The Subcontractor shall submit installation and fusion procedures for HDPE pipe.

Test Procedures: The Subcontractor shall submit a hydrostatic test procedure and a detailed job specific flushing procedure. The flushing procedure shall outline where the flushing water will be obtained and how it will be disposed of in a safe manner. It shall also outline how the flow will be monitored to assure adequate flow and how long the flow must be maintained to adequately flush the piping. This procedure must be submitted for review prior to any connections to existing plant piping.

Certifications: A Contractor's Material and Test Certificate for Under-Ground Piping shall be completed and accepted for each major portion of the work covered by this specification prior to final acceptance of the installation.

Maintenance Manuals: Submit maintenance and operation manuals with complete parts list for all valves and assemblies.

See Section 01300, Submittals and the Vendor Data Schedule for additional submittal requirements.

QUALITY CONTROL:

Codes and Standards: Comply with the requirements of the current revision of the following codes and standards, as specified in this specification:

ASME B31.3

1 PART 2--PRODUCTS

2
3 GENERAL:

4
5 All material, products, and equipment shall be manufactured as specified in this section.

6
7 PIPE AND FITTINGS:

8
9 Double containment pipe shall consist of a carrier pipe installed within a containment
10 pipe. All pipe and fittings shall provide a continuous annular space between the carrier and
11 containment pipes to accommodate possible flow of fluid from the carrier pipe.

12
13 Support spacers, if used, shall be manufactured from non-metallic, corrosion resistant
14 material. Spacers shall be secured to the carrier pipe at nominal 8-foot intervals. The spacers
15 shall maintain the annulus between the carrier and containment pipes and shall be positioned
16 to allow for unrestricted passage of possible flow of fluid from the carrier pipe. Spacers shall
17 be chamfered at both ends to allow for removal of carrier pipe.

18
19 The drain pipe and pressure pipe for the decontamination water shall be double contained as
20 shown on the plans. The drain pipe consists of, 6", 10", 12", and 18" from the
21 decontamination building. These pipes drain the, the contaminated equipment storage pad,
22 and the trench drains in the decontamination building to the lift station.

23
24 From the lift station, the contaminated water is pumped through double contained piping to
25 the evaporation pond in the ICDF. The pressure piping shall consist of a 2" interior pipe and
26 a 6" exterior pipe.

27
28 Similar construction, cleaning, and testing techniques shall be used on the primary or interior
29 pipe and the secondary or exterior pipe.

30
31 High Density Polyethylene (HDPE) Piping and Fittings:

32
33 Service: Decontamination water (pressure and gravity).

34
35 2" and 6" Piping: Piping shall be 100-psi minimum, HDPE SDR17.0, as manufactured
36 by Plexco, Drisco, or CSR Polypipe. (The decontamination water line shall be double
37 contained where shown on the plans.)

38
39 Piping Greater than 6": Piping shall be 80 psi, HDPE SDR 21, as manufactured by
40 Plexco, Drisco or CSR Polypipe.

41
42 2" and 6" Fittings: Fittings shall be 100-psi minimum, HDPE, ends suitable for butt-
43 fusion, UL Listed, per ASTM F 714 and D 3350.

44
45 Fittings Greater than 6": Fittings shall be 80-psi minimum, HDPE, ends suitable for
46 butt-fusion, UL listed per ASTM F714 and D3350.

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Flanges: Flanges shall be slip-on (flat metal plate) 304 SST, 150 psi Plexco in accordance with ANSI B16.21.

Bolts: Bolts shall be SST, ASTM A 193, Grade B8, and Galling Resistant Nitronic 60 nuts, ASTM A 194, Grade 8S (UNS S21800).

VALVES:

Gate Valves (Under Ground): The Gate Valve shall consist of an encapsulated disc with elastomer seat which, in the closed position, effects a seal upon a cast iron body resulting in a bubble tight seal across this disc at a full differential of 200 psi. This shall be accomplished by means of a corrosion resistant threaded bronze stem, acting through a bronze stem nut, fixed into the disc in such as to force the disc seat into the body, affecting a seal when the stem is torqued in the desired direction. Each valve shall be tested from both directions, by the manufacturer, for bubble tight, 200-psi differential sealing ability. Each valve shall also be tested in the "disc up" position at 400 psi resulting in a full shell test. There shall be no leakage at any of the valve's joints or connections. All internal parts shall be accessible without removing the main body from the pressure line. All cast iron internal surfaces of the body shall be coated completely with a corrosion resistant coating. This Resilient-Sealed Gate Valve shall conform to AWWA Standard C-509 latest revision. The internal diameter of the water passageway shall be at least as large as the connecting pipe inside diameter. Valves shall be non-rising stem, 2-in. hub nut with key, Clow Valve, Co. or Kennedy Valve Co.

Gate Valves (Lift Station): The gate valves in the lift station shall be bronze and shall be manufactured by Stockman Valve Co.

Check Valves (Lift Station): The check valves for the lift station shall be as manufactured by AK Industries or GA Industries.

Check Valves (Quick Disconnect Line): The 2" check valve for the quick disconnect line shall be manufactured by Clow Valve Co.

Hand Operated Valve (1" Quick Disconnect): The hand operated stainless steel valve for the 1" quick disconnect shall be by manufactured by Clow Valve Co.

SUBMERSIBLE GRINDER PUMPS:

The Subcontractor shall furnish all labor, materials, equipment, concrete containment, pump basin, pump power cables, ultrasonic level controls and incidentals required to provide three explosion-proof submersible centrifugal sewage grinder pumps. Two pumps shall be installed in the decontamination water lift station.

The Subcontractor shall supply a control panel, which contains all necessary components for proper starting and operation of the pump including control power transformer and flashing

trouble light. This panel shall provide a circuit that monitors the seal sensors, heat sensors in the pump. Each pump control shall have a dry contact (120 Vac, 0.5 amp minimum) to indicate that pump is running. The control power transformer in the decontamination water lift station control panel shall be sized for, and provisions provided to power the leak detection system. Additionally, the control panel shall make provisions to activate the trouble light from a dry contact in the leak detection control panel. The pump assembly shall be provided with all necessary cables to be installed between the pumps, level detectors, and the control panel. Pump wiring shall be in accordance with Section 16120.

Each pump shall be equipped with stainless steel nameplate stating the unit is accepted for use in NEC Class 1, division 1, group C, D, hazardous locations with third party (Factory Mutual) approval.

Each pump shall be rated 2 HP, 460 volts, 3 phase, 60 hertz, 3450 RPM. The unit shall produce 25 GPM at 36-ft. THD, with a maximum input KW of 2.3 KW.

The pump shall be a centrifugal, submersible, grinder, wastewater type, model GILX 200CD as manufactured by Hydromatic Pumps. The pump volute, motor and seal housing shall be high quality gray cast iron, ASTM A-48, Class 30. The pump discharge shall be fitted with 1 ¼" NP flange. All external-mating parts shall be machined and Buna N Rubber O-ring sealed on a beveled edge. Gaskets shall not be acceptable. All fasteners exposed to the pumped liquids shall be 300 series stainless steel.

Each pump shall have a 25' stainless steel 3/16" chain to raise the pumps for maintenance.

Discharge Piping: The pump discharge piping shall be schedule 80 PVC inside the lift station – (ASTM D 3034) transition to underground HDPE pipe.

PUMP WARRANTY:

The pump unit or any part thereof shall be warranted against defects in material or workmanship within one year from date of installation and shall be replaced at no charge with a new or manufactured part, F.O.B factory or authorized warranty service station.

PRECAST CONCRETE CONTAINMENT:

See Section 03400 of these Specifications.

FIBERGLASS BASIN SPECIFICATION:

General: Unless otherwise indicated, the plastics terminology used in this standard shall be in accordance with the definitions given in American Society for Testing and Materials (ASTM) designations D883-69.

1 **MATERIALS:**

2
3 **Laminate:** The laminate shall consist of an inner surface, an interior layer and an exterior
4 layer of laminate body.

5
6 **Inner Surface:** The inner surface shall be free of cracks and crazing with a smooth finish.
7 This may be a gelcoat surface or reinforced with glass surface veil.

8
9 **Interior Layer:** A minimum of 0.100 inch of the laminate next to the inner surface shall be
10 reinforced with not less than 20 percent nor more than 30 percent by weight of
11 noncontinuous glass strands having fiber lengths from 0.5 to 2.0 inches.

12
13 **Exterior Layer:** The exterior layer of body of laminate shall be of construction suitable for
14 the service intended and contain sufficient glass by weight to provide the aggregate strength
15 necessary to meet the tensile and flexural requirements. The exterior surface shall be
16 relatively smooth with no exposed fibers or sharp projections. Hand work finish is
17 acceptable, but enough resin shall be present to prevent fiber show.

18
19 **Tank Wall:** The tank walls must be designed to withstand wall collapse based on the
20 assumption of a hydrostatic pressure of 120 pounds per cubic foot. The tank wall laminate
21 must be constructed to withstand or exceed two times the actual imposed loading on any
22 depth of basin. Stress calculations must be submitted verifying the results obtained using
23 120 pounds per cubic foot hydrostatic pressure and two times actual imposed loading on any
24 depth basin. Depth of bury to be specified on purchase order with wall thickness calculated
25 and guaranteed by the supplier.

26
27 **Tank Bottom:** Must be constructed suitable for the service designated on the plans and these
28 specifications. Under totally water submerged conditions, the center deflection of any empty
29 tank bottom must be less than 3/8 inch as not to interfere with bottom pump mounting
30 requirements and rail systems.

31
32 **Appearance:** The finished laminate shall be as free as commercially practicable from visual
33 defects such as foreign inclusions, dry spots, air bubbles, pin-holes, dimples and
34 delaminations.

35
36 **Basin:** The pump basis shall be constructed of fiberglass. The bottom of the basin shall be
37 reinforced with a fiberglass plate extending beyond the basin diameter for anchoring to a
38 concrete pad. Pump mounting studs will be attached to this plate and installed in pump
39 basin.

40
41 An easy out stainless steel rail system shall be installed in the basin as a means to remove the
42 pumps. A pitless adapter shall be used to connect the pump to the effluent pipe.

FIXTURES, FITTINGS AND TRIM:

Products shall be of the manufacturers listed below:

Identification Ribbon (GFE): Identification ribbon shall be 3-in. minimum wide, with a message printed on the ribbon that identifies the actual pipeline contents.

The plastic ribbon shall be color coded in conformance with the following:

<u>Pipeline Contents</u>	<u>Tape Color</u>	<u>Lettering Color</u>
Wastewater	Brown	White

Locator Ribbon: See Section 02200, Earthwork.

PART 3--EXECUTION

PIPELINES:

Pipe shall be bedded in sand, 4-in. minimum in all directions.

Install pipe to uniform pitches between points for which elevations are established. Provide bends or elbows for changes in directions.

Between bends or elbows, lines shall be straight, free from irregularities, and have smooth interior surfaces. Reducers shall be required for changes in the size of pipes and fittings. Bushings shall not be used.

Pipe shall be laid accurately to the line and grade shown on the drawings. As the work progresses, the interior of the sewer shall be cleared of all superfluous materials.

Pipelines shall be installed in a neat and orderly manner. Installation shall avoid interference with work of the other trades.

HDPE Pipe Joints: Butt-fusion joints shall be made in accordance with the manufacturer's requirements for joining pipe lengths. Mechanical flange joints for valve connections shall be made in accordance with manufacturer's requirements. Flange faces shall be 1/5 times the pipe thickness. Backing rings shall be properly tapered to fit behind HDPE flange faces. Tees shall be connected using no less than two mechanical joints (no more than one butt-fusion joint). Refer to the INEEL Weld Manual Section 2 (19.0 Bonding of Nonmetallic Components).

Pipe Tie-Ins: When performing final tie-ins to existing or new piping which requires cutting, grinding, drilling or other operations and may introduce dirt, chips or debris into the pipe interior, expanding pipe plugs shall be installed in the pipe where possible to prevent contamination spread. These plugs shall be equipped with lanyards, which extend outside

the pipe end to prevent the plug from being inadvertently left in the pipe. No other objects such as rags, cardboard, paper, etc., shall be used in lieu of these plugs. Where it is not possible to install pipe plugs, the Subcontractor shall prepare a work plan, which describes how cleanliness shall be maintained. This plan shall be approved by the Contractor.

PIPE IDENTIFICATION:

Identification Ribbon: All underground piping shall be wrapped with Identification Ribbon. The ribbon shall be wrapped around the pipeline at no less than 1 wrap per 3 ft of run, with the pipe identification label showing.

Locator Ribbon: See Section 02200, Earthwork.

POTABLE WATER SEPARATION:

Potable water lines include only potable water (CW). Utility lines includes fire water (FW), raw water (RW). Process lines shall include all other process, waste, sanitary, and service lines.

Potable water lines may be installed in a common trench with fire water and raw water. The minimum horizontal separation is one foot measured between the two closest outside walls of the potable water and the fire water and the raw water. See Section 02713 for other potable water requirements.

Potable water lines shall be separated from process lines by a minimum of 10-ft. horizontally, or separated by 6-ft. horizontally and 18-in. vertically and the process line shall be constructed, as a minimum, to the requirements of the water line, or encased in 4" minimum of concrete all around, or double encased in welded Sch. 40 CS or polyethylene pipe sealed at both ends.

CLEANSING AND TESTING:

Flushing of Piping: New underground primary and secondary drain pipe and lead-in connections shall be flushed thoroughly immediately after tie-in to system is made.

Flush primary and secondary underground pipes through accessible aboveground flushing outlets allowing the water to run until clear and move any foreign material out of the piping.

Test of Piping System: All new underground primary and secondary drain pipes and pressure pipes shall be hydrostatically tested in accordance with Section 02733 Pressure Testing of HDPE Piping."

Testing and flushing shall be witnessed by the Contractor's Representative.

The Subcontractor shall provide splash blocks to avoid scour and erosion when removing the test water from the pipe.

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1 FIELD QUALITY CONTROL:

2

3 Surveillance will be performed by Contractor's Representative to verify compliance of the
4 work to the drawings and specifications.

5

6 Prior to covering the pipe, the Contractor shall have an Engineer registered in the State of
7 Idaho, inspect and certify that the installation is proper and is in compliance with these
8 procedures.

9

10 END OF SECTION 02732

1 SECTION 02733--PRESSURE TESTING OF HDPE PIPING

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 Section Includes: Work includes, but is not limited to:

8
9 Pressure testing all new HDPE drain and pressure piping of the decontamination
10 water (WW), sanitary sewer (WQ), and potable water (CW) systems.

11
12 SUBMITTALS:

13
14 Calibration data of testing equipment.

15
16 Subcontractors written testing procedure.

17
18 Subcontractor test reports.

19
20 PART 2--PRODUCTS

21
22 MATERIAL:

23
24 The Subcontractor shall furnish all materials, instruments, and equipment (except
25 government furnished material and equipment) required to perform the pressure tests. All
26 test equipment shall have been calibrated within 30 days of use, be in good working order
27 and have gauges accurate to within $\pm 3.0\%$ of span.

28
29 PART 3--EXECUTION

30
31 PROCEDURE:

32
33 General: Testing shall be performed after fabrication and before piping is initially placed in
34 service. All pressure joints (including welds) shall be exposed during tests.

35
36 Potable Water and Sanitary Sewer Piping: The potable water and sanitary sewer piping shall
37 be tested in accordance with these Specifications.

38
39 Double Contained Piping: The primary, or internal, piping shall be tested first. The
40 secondary shall then be tested. The primary piping shall be left open and filled with the
41 secondary piping test water during the test of the secondary piping.

42
43 Testing: As a result of testing, those welds, joints, surfaces, areas, etc., found to be
44 unacceptable shall be repaired and the item retested. The Contractor's Representative shall
45 be notified of any test failures. This procedure shall continue until the item is shown to be
46 acceptable.

When conditions require that a pressure test be maintained for a period of time during which the testing medium in the system would be subject to thermal expansion, provisions shall be made for the relief of the excess pressure so caused.

After satisfactory completion of a test, all temporary blinds are to be removed. Valves, short pieces of piping and any other items removed for the test are to be reinstalled. Valves that are closed solely for testing shall be opened.

In general, all pressure tests shall be hydrostatic pressure tests.

Test Pressure: Test Pressures for the System Services are as follows:

Drain Pipe--120 psi (Design--80 psi)

Sanitary Sewer Pipe--150 psi (Design--100 psi)

Potable Water Pipe--225 psi (Design--160 psi)

Hydraulic Testing of HDPE Pipe:

General: The potable water is the test medium to be used.

After all free air is removed from the test section, raise the pressure at a steady rate to the required pressure. The pressure in the section shall be measured as close as possible to the lowest point of the test section. Butt-welded and mechanical joints shall be left uncovered until after completion of the hydraulic testing.

Initially, the pipe should be raised to test pressure and allowed to stand without makeup pressure for a sufficient time to allow for expansion of the pipe. This usually occurs within 2-3 hours. After equilibrium is established, the test section is pressurized to the test pressure, the pump turned off, and the final test pressure is held for 3 hours.

Polyethylene pipe holds pressure by developing stress in its walls. This process continues throughout the test period and the pipe increases slightly in diameter. A pressure drop will occur due to continued expansion of the pipe during the second phase of the test. A drop in pressure during the test phase is common and does not prove with absolute certainty that a leak or failure is present in the system. Polyethylene pipe is tested by measuring the "Make-up" water required to return the section to test pressure. Allowable amounts of makeup water for expansion during the pressure test is per manufacturer's recommendations. The allowable amount of make-up water shall be specified in the Subcontractor's test procedure. If the test pressure is not returned within the allowable volume of water, the test fails. If there are no visual leaks or significant pressure drops during the final test period, the pipeline passes the test.

Caution: Changes in temperature will increase or decrease the apparent test pressure in any piping system. The effect depends on the rate of expansion of the pipe wall compared to the water in the pipe. Polyethylene has a higher rate of expansion and contraction than water. When the HDPE piping system becomes heated (e.g. on a summer day), the system pressure

will decrease. When the HDPE piping system becomes cooler, the system pressure will increase. When possible, testing shall be done during periods of relatively stable atmospheric temperatures.

Under no circumstances shall the total time under the test exceed eight (8) hours at the pressure rating. If the test is not completed due to leakage or equipment failure, the test section shall be allowed to "relax" for eight (8) hours prior to the next test.

After satisfactory completion of a test, all temporary blinds are to be removed. Valves, short pieces of piping and any other items removed for the test are to be reinstalled with proper gasketing. Valves that are closed solely for testing shall be opened.

Potable water shall be used for these tests. Disposal of test water shall be into the ICDF evaporation ponds.

Vents or other connections shall be opened to eliminate air from lines, which are to receive a hydrostatic test. Lines shall be thoroughly filled before test pressure is applied. Vents shall be opened when draining systems following the hydrotest. All instruments, which might be damaged during the test, shall be disconnected. The Subcontractor shall submit a written hydrostatic pressure testing procedure to be approved by the Contractor prior to beginning a test. The procedure shall include a test record to be completed after the test. See Test Records section of this Specification.

TEST RECORDS:

Accurate test records shall be kept on each system tested. Each test shall be witnessed and approved by the Contractor's Representative. The Contractor's Representative shall be notified forty-eight (48) hours prior to beginning a test.

Test Reports shall include for each Test and Retest:

Identification of system (including all line numbers)

Testing medium

Test pressure and pressure steps

Date and Contractor's approval

Results

Contractor's Representative approval space

Repairs and retests

Calibration dates of testing and equipment.

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1 FIELD QUALITY CONTROL:

2

3 Contractor Inspections: Surveillance will be performed by the Contractor's Representative to
4 verify compliance of the work to the drawings and specifications.

5

6 END OF SECTION 02733

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SECTION 03300--CAST IN PLACE CONCRETE

PART 1--GENERAL

SUMMARY:

Section Includes, but is not limited to:

Footings and foundations
Below grade trenches and pits
Truck scale support slab, approaches, pedestal support for remote display
Curbs
Miscellaneous exterior pads not covered in other sections
Guardpost fill
Postensioned slab
Thrust blocks

REFERENCES:

The following documents, including others referenced therein, form part of this Section to the extent designated herein:

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 117 Standard Specifications for Tolerances for Concrete Construction and Materials
ACI 301 Specifications for Structural Concrete for Buildings
ACI 305 Hot Weather Concreting
ACI 306.1 Standard Specification for Cold Weather Concreting
ACI 318 Building Code Requirements for Reinforced Concrete
ACI 347 Guide to Formwork for Concrete

CONCRETE REINFORCING STEEL INSTITUTE, (CRSI)

CRSI Manual of Standard Practice

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 94 Standard Specification for Ready-Mixed Concrete

The following ASTM specifications are referenced in regard to materials:

ASTM A 185 Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

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- 1 ASTM A 706 Standard Specification for Low-Alloy Steel Deformed and Plain Bars
- 2 for Concrete Reinforcement
- 3 ASTM C 33 Standard Specification for Concrete Aggregates
- 4 ASTM C 150 Standard Specification for Portland Cement
- 5 ASTM C 260 Standard Specification for Air-Entraining Admixtures for Concrete
- 6 ASTM C 309 Standard Specification for Liquid Membrane-Forming Compounds for
- 7 Curing Concrete
- 8 ASTM C 494 Standard Specification for Chemical Admixtures for Concrete
- 9 ASTM C 618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural
- 10 Pozzolan for Use as a Mineral Admixture in Concrete
- 11

12 The following ASTM standards shall be used by the inspecting agency for concrete tests or
13 inspections:

- 14
- 15 ASTM C 31 Standard Practice for Making and Curing Concrete Test Specimens in
- 16 the Field
- 17 ASTM C 39 Standard Test Method for Compressive Strength of Cylindrical
- 18 Concrete Specimens
- 19 ASTM C 143 Standard Test Method for Slump of Hydraulic Cement Concrete
- 20 ASTM C 172 Standard Practice for Sampling Freshly Mixed Concrete
- 21 ASTM C 231 Standard Test Method for Air Content of Freshly Mixed Concrete by
- 22 the Pressure Method
- 23

24 SUBMITTALS:

25

26 Submittals include, but are not limited to the following:

27

28 Mix Design: Submit mix design for each grade of concrete used.

29

30 See Section 01300, Submittals and the Vendor Data Schedule for additional submittal

31 requirements.

32

33 QUALITY CONTROL:

34

35 Comply with provisions of ACI 301 unless otherwise specified herein.

36

37

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1 PART 2--PRODUCTS

2
3 FORM MATERIALS:

4
5 Forms for Exposed Finish Concrete: Provide continuous, straight, smooth, exposed surfaces.
6 Furnish in largest practicable sizes to minimize number of joints. Provide form material with
7 sufficient thickness to withstand pressure of newly-placed concrete without visible bow or
8 deflection:
9

10 Plywood shall comply with American Plywood Association, grade "EXT-DFPA
11 PLYFORM" or better.
12

13 Forms for Unexposed Finish Concrete: Form concrete surfaces, which will be, unexposed in
14 finished structure with plywood, lumber, or metal.
15

16 Form Coatings: Provide commercial formulation form-coating compounds that will not bond
17 with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments
18 of concrete surfaces.
19

20 REINFORCING MATERIALS:

21
22 Reinforcing Bars: ASTM A 615 Grade 60 deformed, as indicated on the drawings. Grade 40
23 may be used for No. 4 and smaller ties.
24

25 Welded Wire Fabric (WWF): ASTM A 185, welded steel wire fabric, 6 x 6 W1.4 x W1.4.
26

27 Tie Wire: ASTM A82.
28

29 Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs,
30 spacers and other devices for spacing, supporting and fastening reinforcing in place. Use
31 wire bar type supports complying with CRSI recommendations, or approved substitute. Use
32 supports with sand plates or horizontal runners where base material will not support chair
33 legs. Pumice blocks, adobe, bricks, rocks, etc. are not acceptable for rebar or wire mesh
34 supports.
35

36 CONCRETE MATERIALS:

37
38 Portland Cement: Cement shall conform to ASTM C 150, Type I-II. The cement shall
39 contain no more than 0.60% by weight of alkalies calculated as (Na₂O + 0.658 K₂O).
40

41 Aggregate: Fine and coarse aggregate shall conform to ASTM C 33. Maximum coarse
42 aggregate size shall conform to ACI 318 paragraph 3.3.2. For post-tensioned slab maximum
43 aggregate size shall be 1-in. Unless otherwise specified, maximum aggregate size shall be
44 1 1/2 in.
45

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1 Mixing Water: Potable having no pronounced taste or odor, and containing no deleterious
2 materials.

3
4 Air-Entraining Agents (AEA): ASTM C 260.

5
6 High Range Water-Reducing Admixture (Superplasticizer): If a superplasticizer is used it
7 shall conform to ASTM C 494, Type F.

8
9 Water-Reducing Admixtures: If water-reducing admixtures are used they shall conform to
10 ASTM C 494, Type A, and contain no more than 1% chloride ions.

11
12 Calcium Chloride: Calcium chloride is not permitted.

13
14 Pozzolans: Pozzolans (fly ash) shall conform to ASTM C 618 Class F, except that the loss
15 on ignition (LOI) shall be less than 2%.

16
17 RELATED MATERIALS:

18
19 Nonshrink Grout: Provide one of the following:

- 20
21 "Masterflow 713;" MBT Protection and Repair
22 "SonogROUT 10K;" Sonneborn Building Products
23 "Five Star Grout;" Five Star Products, Inc.

24
25 Curing Compound: Curing compound or curing-hardener-sealer compound shall comply
26 with ASTM C 309, Type I, Class A.

27
28 The compound shall be compatible with adhesives or paints if it is to be applied in areas to
29 receive paint or floor covering requiring adhesives. Areas of concrete to receive mortar set
30 tile shall not be cured by a curing compound. The number of coats shall be as recommended
31 by the manufacturer, but in any case, floor slabs to be left exposed shall receive at least a
32 second coat just after final clean-up.

33
34 Bonding Compound: Provide one of the following:

- 35
36 "Everbond" L & M Construction Chemical Corporation
37 "Sikabond" Sika Corporation
38 "Weld-Crete" Larsen Products Corporation.

39
40 Waterstop: Swellstop as manufactured by Greenstreak Plastic Products Company, Inc.

41
42 Joint Sealing Compound: Provide a polyurethane joint sealant material.

43
44 Expansion Joint Material: Provide 1/2 in. asphalt impregnated fibrous expansion material.

45

Red Coloring for Electrical Duct Encasement: Commercial grade red iron oxide, 3 lb per sack of cement.

PROPORTIONING AND DESIGN OF MIXES:

Mix Design: Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 318.

Design mixes to provide normal weight concrete with the following specified 28-day compressive strengths, minimum, as indicated on drawings and schedules:

Class 20:	2000 psi (for conduit and pipe encasement and thrust blocks)
Class 20:	2000 psi (guardpost fill)
Class 40:	4000 psi (decontamination building footings, postensioned slab, piers and grade beam)
Class 45:	4500 psi (exterior equipment pad, postensioned slab, truck scale concrete)

See FIELD QUALITY CONTROL of this specification for acceptance criteria.

Adjustment to concrete mixes may be requested by the Subcontractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Revised mix designs must be submitted and approved prior to use.

The concrete mix shall contain a pozzolan (fly ash). The minimum amount of fly ash shall be 15% by weight of the total cementitious materials unless otherwise approved.

Concrete in hard-to-place locations may utilize a high-range water reducer. No other water-reducer shall be used with a high-range water-reducer.

Durability: Concrete which will be subject to freezing and thawing, weathering, or deicer chemicals shall be air-entrained. Add air entraining agent (AEA) at the manufacturer's prescribed rate to result in concrete at point of placement having air content within the following limits:

Maximum aggregate size (in.)	Air content (percent)	
	Severe exposure	Moderate exposure
1/2	5 1/2 to 8 1/2	4 to 7
3/4	4 1/2 to 7 1/2	3 1/2 to 6 1/2
1	4 1/2 to 7 1/2	3 to 6
1 1/2	4 to 7	3 to 6

Concrete which will be subject to deicer chemicals or freezing and thawing in a moist condition shall have a minimum 28 days compressive strength of 4,500 psi and a maximum water-cementitious materials ratio of 0.45.

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Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

Reinforced foundations: 3 ± 1 in.

Slabs and other structural concrete: $3 \frac{1}{2} \pm 1 \frac{1}{2}$ in.

Red concrete for conduit encasement: Not less than 3 in. and not more than 6 in.

Maximum slump for concrete using a high-range water-reducer may be increased to 8 in. at point of placement.

MIXING AND DELIVERY:

The manufacture and delivery of all concrete shall conform to ASTM C 94 except as modified herein. Hand-mixed concrete is prohibited.

When concrete arrives at the job site with slump below that suitable for placing, as indicated by the specification, water may be added only if the maximum permissible water-cement ratio and the maximum permissible slump is not exceeded. Any water thus added to bring the slump within required limits shall be injected in such a manner that uniformity requirements are met. Water shall be incorporated by additional mixing equal to at least half of the total mixing required or 30 drum revolutions at rated mixing speed, whichever is more. Additional AEA may be introduced during this mixing period if necessary to meet specifications. Neither water nor AEA shall be added to the batch at any later time.

Concrete uniformity shall meet the requirements of ASTM C 94 except as modified herein. After final mixing is complete, visible lumps, nonconformance to uniformity requirements, or failure to meet specified slump, entrained air and temperature requirements shall be considered cause for rejecting the remainder of the load. In addition, failure of the ready-mix truck drum to meet uniformity requirements will be deemed cause for rejection of the mixing equipment until adequate repairs have been made.

Discharge of the concrete shall be completed within 1-1/2 hrs, or before the drum has revolved 300 revolutions, whichever comes first, after the introduction of mixing water to the cement and aggregates. The Contractor may extend this 1-1/2 hr limit if the concrete still meets all specified requirements after 1-1/2 hrs. (Additional testing to verify conformance to specifications may be necessary.) In hot weather or under conditions contributing to quick stiffening of the concrete a time limit less than 1-1/2 hrs may be designated by the Contractor.

High-range water-reducing admixtures (superplasticizer) shall be added to the mixer at the job site, and then be allowed to mix for at least 5 min.

Concrete that is rejected for failure to meet any of the above requirements will be evaluated by the Contractor and may be removed and replaced at the expense of the Subcontractor.

Hot or Cold Weather Concreting: Methods and means of batching, mixing and delivery of concrete in hot or cold weather shall comply with ACI-301 or ACI-306.1

SOURCE QUALITY CONTROL:

The Subcontractor shall provide the necessary testing and monitoring to qualify proposed materials and establish mix designs.

PART 3--EXECUTION

FORMS:

Unless otherwise shown on the drawings, all forms shall be straight and plumb, rigid and mortar tight. All forms shall be braced, tied and supported sufficiently to maintain their required position during and after the placing of concrete. Joints shall be sufficiently tight to prevent mortar leakage. Where shown on the drawings, suitable moldings shall be placed in forms to shape edges or surfaces of concrete members. All formwork shall conform to the guidelines in ACI 347.

All exposed corners of concrete shall be chamfered 1 in.

Form Ties: Use factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surface upon removal:

Unless otherwise indicated, provide ties so those portions remaining within concrete after removal will not be within 1 in. of any exposed concrete surface.

Form ties for walls subject to hydrostatic pressure shall have water seals.

Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades.

Tolerances: Unless otherwise noted on the drawings, formwork shall be constructed so that the concrete surfaces conform to the tolerance limits listed in ACI 117.

Preparation of Form Surfaces: Coat contact surfaces of forms with a form-coating compound before reinforcement is placed. Do not allow form-coating compound to come into contact with reinforcement or with concrete surfaces against which fresh concrete will be placed.

PLACING REINFORCEMENT:

Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations.

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Place reinforcement to obtain at least minimum coverages for concrete protection. Unless otherwise indicated, reinforcement position shall be as necessary to meet coverage, spacing and placement requirements specified in ACI 318, Chapter 7.

Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full grid plus 2 in. and lace splices with wire of same gage. Fabric shall be supported on metal chairs placed on 8 in. x 8 in. x 22 gage sheet metal base plates and spaced to meet placement tolerance requirements of ACI 318, Chapter 7.

Unless otherwise shown on the drawings, splicing of reinforcement shall be in accordance with ACI 318, Chapters 7 and 12. Unless otherwise indicated on the drawings, all splices shall be Class B tension splices for regular bars.

JOINTS:

Construction Joints: Locate and install construction joints, when not shown on drawings, so as not to impair strength and appearance of the structure, and as acceptable to the Contractor's Representative.

Provide keyways at least 1 1/2 in. deep in all construction joints unless otherwise noted.

Isolation (Expansion) Joints in Slabs-on-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundations walls, and as indicated on the drawings. Provide expansion joint material in all isolation joints. Material shall be placed 1/4 in. below slab elevation and extend the full depth of the slab.

Asphalt and Slabs-On-Ground Interface: Sawcut existing asphalt where concrete and asphalt are to meet in order to provide a straight, clean joint.

INSTALLATION OF EMBEDDED ITEMS:

Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by cast-in-place concrete. Secure all such items firmly in position.

CONCRETE PLACEMENT:

Preplacement Inspection: Completed formwork, reinforcing steel, and items to be embedded shall be inspected and approved prior to placement. However, such approval shall in no way release the Subcontractor from responsibility for acceptable and satisfactorily completed work. For concrete cast against soil, the soil shall be free from frost or ice and shall be wetted down before placement.

Placing Concrete in Forms: The concrete shall be deposited continuously in horizontal layers not more than 2 ft in depth with each succeeding layer placed before the preceding layer has reached its initial set.

Consolidation: During and immediately after placing, all concrete shall be consolidated sufficiently to provide thorough placement around all reinforcement, embedded items, and into corners of forms without segregating the mix. Vibration shall penetrate the placed layer and at least 6-in. into the preceding layer. Do not use vibrators to move concrete inside the forms. A spare vibrator shall be on hand at the job site and available to substitute for any other vibrator which fails during placement.

Dropping of Concrete: Maximum allowable free vertical drop shall be 5 ft, but dropping of concrete from this height through reinforcement (as in columns and walls), or other conditions causing segregation, shall be avoided. For drops greater than 5 ft, a confining device shall be used, subject to the approval of the Contractor.

Cold Weather Placing: Protect concrete work from damage or reduced strength which could be caused by frost, freezing, or low temperatures, in compliance with ACI 306.1 and as specified herein. Minimum concrete temperature as placed and maintained shall be 55° F, or as required by ACI-306.1, Table 3.2.1.

Hot Weather Placing: When hot weather conditions that would seriously impair quality and strength of concrete exist, place concrete in compliance with ACI 305 and as specified herein:

Cool mixing drum and/or ingredients before mixing to maintain concrete temperature below 95° F at time of placement.

FINISH OF FORMED SURFACES:

Rough Form Finish (RfFm): Provide as-cast rough form finish to formed concrete surfaces that are to be concealed in finish work or by other construction, unless otherwise indicated.

Standard rough form finish shall be the concrete surface having the texture imparted by the form facing material used, with tie holes and defective areas repaired and patched and all fins and other projections exceeding 1/4 in. in height rubbed down or chipped off.

Smooth Form Finish (SmFm): Provide as-cast smooth form finish for formed concrete surfaces that are exposed-to-view, or that are covered with a coating material applied directly to concrete, or a covering material bonded to concrete such as waterproofing, dampproofing, painting, or other similar system.

Produce smooth form finish (SmFm) by selecting form material to impart a smooth, hard, uniform texture and arranging them orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

Related Unformed Surfaces: At tops of wall, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike off smooth and finish with texture matching adjacent formed surfaces.

Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green, and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on subcontract or approved shop drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnished machines and equipment.

SLAB FINISHES:

Float Finish (Flt): Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, and as otherwise shown on drawings or in schedules.

After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power driven floats, or by hand floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 1/4 in. in 10 ft when tested with a 10-ft straightedge placed on surface at not less than two different angles. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to uniform, smooth, granular texture.

Trowel Finish (Trw): Apply trowel finish to monolithic slab surfaces to be exposed to view, unless otherwise indicated, and slab surfaces to be covered with paint, or other thin-film finish coating system.

After floating, begin first trowel finish operation using power-driven trowel. Begin final troweling when surface produces ringing sound as trowel is moved over surface.

Consolidate concrete surface by final hand troweling operation, free of trowel marks, uniform in texture and appearance, and with surface plane tolerance not exceeding 1/8 in. in 10 ft when tested with a 10-ft straightedge.

Nonslip Broom Finish (Brm): Apply nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as shown on drawings or in schedules.

Immediately after float finishing, slightly roughen concrete surface by brooming in direction perpendicular to main traffic route.

1 CONCRETE CURING AND PROTECTION:

2
3 General: Protect freshly placed concrete from injurious action by sun, rain, wind, flowing
4 water, mechanical injury and premature drying for not less than seven (7) consecutive days
5 after placement.

6
7 Protect concrete against damage from frost or freezing for a minimum of 3 days. Provisions
8 of ACI 306.1 shall apply for cold weather unless otherwise specified.

9
10 Alternatively, if tests are made of cylinders kept near the structure and cured by the same
11 methods, moisture retention measures may end when the average compression strength has
12 reached 70% of the specified strength. Other alternatives such as those given in ACI 301,
13 5.3.6 may also be used if approved by the Contractor.

14
15 Early Loading of New Concrete: Early loading of concrete structures shall comply with
16 requirements of ACI 318, Section 6.2. When construction loading is proposed before
17 concrete has achieved its 28-day design strength, structural calculations and concrete strength
18 test data shall be submitted and approved prior to loading.

19
20 Curing Methods: Perform curing of concrete by one or more of the following methods:

21
22 Moist Curing: Cover concrete surfaces with moisture retaining cover for curing period.
23 Exposed horizontal concrete surfaces may be covered with sand or other approved material
24 and kept wet for the required period. Wood forms shall be kept sufficiently wet at all times
25 to prevent the forms from separating at the joints and the concrete from drying.

26
27 Membrane Curing: Concrete surfaces to receive membrane curing shall be treated with a
28 curing compound as specified or otherwise approved. The curing compound shall be applied
29 in strict accordance with the directions of the manufacturer of the compound.

30
31 Temperature, Wind, and Humidity:

32
33 Cold Weather: When the mean daily outdoor temperature is less than 40° F, the
34 temperature of the concrete surface shall be maintained between 55 and 90° F for the
35 required curing period. When necessary, arrangements for heating, covering,
36 insulating, or housing the concrete work shall be made in advance of placement and
37 shall be adequate to maintain the required temperature without injury due to
38 concentration of heat. Combustion heaters shall not be used during the first 24 hrs
39 unless precautions are taken to prevent exposure of the concrete to exhaust gases that
40 contain carbon dioxide. If early loading is anticipated during cold weather, provide
41 temperature protection to insure necessary strength development.

42
43 The concrete surface temperature requirements (based on section thickness) in ACI
44 306.1 may be used in lieu of the 55° F minimum specified before.

If concrete surface temperatures as measured by the inspecting agency are below the minimum curing temperature but meet the freeze protection requirements, the concrete curing period shall be extended to ensure adequate strength is developed. The extension time shall be at least equivalent to the time period in which temperatures were too low.

Hot Weather: The concrete surfaces shall be kept below 100° F for the curing period. When necessary, provision for windbreaks, shading, fog spraying, sprinkling, ponding, or wet covering with a light colored material shall be made in advance of placement, and such protective measures shall be taken as quickly as concrete hardening and finishing operations will allow.

Rate of Temperature Change: Changes in temperature of the air immediately adjacent to the concrete during and immediately following the curing period shall be kept as uniform as possible and shall not exceed 5° F in any 1-hr or 50° F in any 24-hr period.

REMOVAL OF FORMS:

Formwork Not Supporting Weight of Concrete: This formwork may be removed after cumulatively curing at not less than 50° F for 32 hrs after placing concrete, provided concrete is sufficiently hard not to be damaged by form removal or subsequent operations. Curing must then continue through the minimum curing period.

Formwork Supporting Weight of Concrete: This formwork may not be removed until concrete has attained its 28-day design compressive strength, except as permitted under "Early Loading of New Concrete".

CONCRETE SURFACE REPAIRS:

All porous and fractured concrete shall be repaired. Surface defects may be repaired by patching. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins, snap-tie holes and other projections on the surface. The Contractor shall approve all repairs. Alternate repair methods not specified may be used if approved by the Contractor.

Patch Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when approved by the Contractor. Cut out honeycomb, rock pockets, and voids over 2 in. in any dimension. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding agent has dried.

Defects exceeding 2 in. in diameter shall be repaired by removing defective areas, cleaning, treating with bonding agent, and replacing with new concrete.

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FIELD QUALITY CONTROL:

Subcontractor Supplied Testing: The Subcontractor shall provide the necessary testing and monitoring services for the following:

Other testing services needed by the Subcontractor to control or monitor the production, transportation, placement, protection, curing or temperature of the concrete.

The use of Contractor supplied inspection or testing services shall in no way relieve the Subcontractor of the responsibility to furnish materials and construction in full compliance with the subcontract documents.

Contractor Supplied Testing: The Contractor's Representative will perform tests during placement and curing of the concrete. Monitoring of concrete protection and curing methods will also occur.

Sampling and testing for quality control during placement of concrete will include the following:

Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

Slump: ASTM C 143.

Air Content: ASTM C 231.

Concrete Temperature: Test when air temperature is 40 F or below, or when 90° F or above, and at any other times as selected by the Contractor.

Concrete Uniformity Test for Adequacy of Mixing Equipment: ASTM C 94.

Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed.

Subsequent tests may include:

Compressive Strength Tests: ASTM C 39; frequency of testing shall comply with ACI 318, Chapter 5, Section 5.6, unless otherwise directed.

Strength level of an individual class of concrete shall be considered satisfactory if both of the following requirements are met:

Average of all sets of three (or less if three are not available) consecutive strength tests equal or exceed the specified 28-day compressive strength.

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1 No individual strength test (average of two cylinders) falls below the specified 28-day
2 compressive strength by more than 500 psi.

3
4 Inspection or test results not conforming to the stated requirements of this
5 specification shall be reported to the Operating Contractor's Project Manager for
6 evaluation and disposition with the concurrence of the Architect/Engineer.

7
8 Nondestructive Tests: Testing by impact hammer, sonoscope, or other nondestructive
9 device may be performed to determine relative strengths at various locations in the
10 structure as an aid in evaluating concrete strength in place or for selecting areas to be
11 cored. Such tests, unless properly calibrated and correlated with other test data, shall
12 not be used as a basis for acceptance or rejection of the concrete.

13
14 Surveillance will be performed by the Contractor's Representative to verify compliance of
15 the work to the drawings and specifications.

16
17 END OF SECTION 03300

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SECTION 03365--POST TENSIONED CONCRETE

PART 1--GENERAL

SUMMARY:

The Subcontractor shall provide design, labor, materials, and equipment necessary to construct post-tensioned concrete slabs as indicated on the drawings and as specified herein.

Related Sections:

03300 Cast-In-Place Concrete

REFERENCES:

The latest edition of the following documents, including others referenced herein, form part of this Section to the extent designated:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A416/A Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete

AMERICAN CONCRETE INSTITUTE

ACI 318 Building Code Requirements for Reinforced Concrete
ACI 318R Commentary on Building Code for PCI "Losses" PCI Committee on Prestress Losses, "Recommendations for Estimating Prestress Losses", Prestressed Concrete Institute, Volume 20, No.4, July/August 1975, pp. 43-75.

POST-TENSIONING INSTITUTE

Design and Construction of Post-Tensioned Slabs-On-Ground.

Construction and Maintenance Procedures Manual for Post-Tensioned Slabs-On-Ground Construction

All other applicable codes, specifications, and standards referenced in Section 03300.

DESIGN REQUIREMENTS:

General: All post-tensioned concrete slabs-on-ground shall be designed in accordance with PTI's "Design and Construction of Post-Tensioned Slabs-On-Ground."

Loads: Other than dead loads the slabs shall be designed for the following live loads:

Decon Building Truck Bay: HS-20 truck load (unfactored).

Decon Building Treatment Room: 8,000 lb. Forklift wheel load (unfactored).

Contaminated Equipment Pad: HS-20 truck load (unfactored).

Modules of Subgrade Reaction: Assume 400 pci minimum.

SUBMITTALS:

Shop Drawings: Submit shop drawings detailing the items listed below. Each drawing must be stamped by a registered professional engineer licensed to practice civil or structural engineering in the state of Idaho.

1. Dimensioned tendon layout locating tendons in horizontal plane.
2. Tendon profile locating centerline of prestress with respect to bottom of post-tensioned element. Show chairs, chair heights, location of support steel, and other information regarding tendon support methods.
3. End anchorage details.
4. Jacking forces, initial and anchorage.
5. Required elongations.
6. Clearance requirements for stressing equipment.

Calculations: Submit calculations showing detailed design of uniform thickness post-tensioned slab assuming stable soil conditions. Show all assumptions including assumed losses for prestressing materials according to ACI 318R. Calculations must be stamped by a registered professional engineer licensed to practice civil or structural engineering in the state of Idaho.

Deviations: If proposed materials, layout, or methods deviate from those shown on drawings or specifications, submit calculations analyzing the materials and methods proposed.

Qualification Data: Submit data verifying qualification of specialty firm and foremen including references.

Standards: Submit letter stating that specialty firm has in their possession and will have on the jobsite copies of referenced standards and that management and foreman are knowledgeable about provisions that relate to this project.

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1 Calibration: Submit certified calibration test curves and results for stressing jacks.

2
3 Measurement of Elongations: Submit narrative and details showing means of measuring
4 elongations and tolerances for measurement. Submit elongation reports.

5
6 QUALITY CONTROL:

7
8 Specialty Firm Qualifications: Firms with at least 5 years successful experience including
9 post-tensioned concrete slab-on-grade projects of similar or larger scope and complexity.

10
11 Foreman Qualifications: Person with not less than 3 years field experience in foreman's
12 capacity on projects of similar or larger scope and complexity.

13
14 Definitions:

15
16 Post-tensioning: Any method of prestressing where the tendon is tensioned after the concrete
17 has reached a specified strength.

18
19 Tendon: Refers to any single post-tensioning unit used to apply prestress force to the
20 concrete member whether composed of one or more elements.

21
22 Unbonded Tendons: Refers to ungrouted tendons that are shop-coated and encased in
23 slippage sheathing to prevent bond, to retard corrosion, and to reduce friction.

24
25 Experience and Qualifications:

26
27 Employ and pay for services of a specialty subcontractor to perform prestressing work.

28
29 Require specialty subcontractor to perform the following:

- 30
31 1. Before start of work, meet with Contractor to establish complete sequence and
32 schedule of concrete placement and post-tensioning work. Indicate construction joints,
33 stressing points, intermediate stressing points, and dead end locations. Specialty
34 subcontractor may submit alternate plan of joints, stressing points, etc. for approval.
35
36 2. Compute losses and provide final prestress forces indicated using materials and
37 methods complying with ACI 318, and PCI "Losses".
38

39 PART 2--PRODUCTS

40
41 POST-TENSIONING TENDONS AND ACCESSORIES:

42
43 Strand: Uncoated, seven-wire stress-relieved steel strand meeting requirements of ASTM
44 A416, Grade 270, Low Relaxation.
45

Tendon Coating: Fabricated coated tendons shall be shop coated with coating compound to prevent bond, reduce friction and resist corrosion. The tendon shall be encased in slippage sheathing to further assure prevention of bond and maintain the element in proper diameter. Tendon coating compound: Tendon wire shall be completely shop coated with a non-volatile, low friction mineral oil base grease with a rust preventing additive. This coating material shall have a relatively uniform viscosity under temperature ranges of -200 to 1200 degree F.

Slippage Sheathing: Plastic, heavy paper, felt, or other material, except aluminum, and the following:

1. Capable of maintaining the group of wires tightly bundled
2. Containing the wire coating compound during shipment, placing, and concreting.
3. Preventing admission of concrete and mortar during concreting operations.

Anchorage and Couplers: Hardware shall meet the minimum requirements set forth in ACI 318, Chapter 18.

PART 3--EXECUTION

FORMWORK:

Comply with applicable provisions of Section 03300, Cast-In-Place Concrete for formwork and as specified.

Design formwork for any additional loads induced during stressing by shifting load from one part of the formwork to another.

Secure stressing assemblies at tendon terminals to the formwork designed to maintain tendon in a fixed position during concreting.

Do not remove forms until stressing operation is complete and elongations are approved.

HANDLING and PLACING OF TENDONS:

Have the complete tendons shipped coiled or bundled and fastened on shipping racks to protect tendons from damage during transit and storage at the job site. Protect from excessive corrosion and keep free of deleterious substances before placing.

Place supports for tendons to insure their remaining in proper position during the placing of the concrete. Unless otherwise indicated, supports for tendons shall be located at 5'-0" maximum centers. Vertical tendon dimensions shall vary not more than 1/8" in slabs and 1/4" in beams from the dimensions shown on the drawings.

1 In no case shall the minimum clear coverage for tendons be less than 3/4" for slabs, and shall
2 be according to ACI.

3
4 Cut back slippage sheathing at stressing ends of tendon before concrete in place to ensure
5 correct installation of anchoring device.

6
7 Do not nick, bend, or damage in any way the tendons, coupler hardware, and anchorages
8 during heading or prestressing of tendons. Repair tears, holes, and other damages in the
9 slippage sheathing by re-wrapping before concreting begins.

10
11 If required, and where approved, couple the prestressing tendons to develop continuity with a
12 strength equal to at least 95 percent of the specified tensile strength of the tendons. The
13 coupler shall be detailed to transfer the post-tensioning force through the coupler without
14 creating bending moments in the tendon. Coupler hardware shall be clean and free of
15 deleterious substances.

16
17 Construct anchorages to develop 95 percent of the specified tensile strength of the tendons,
18 both individually and as a group, without slippage, distortion or other changes that will allow
19 loss of stress. The anchorage shall be detailed to transfer the post-tensioning force to the
20 concrete without creating bending moments in the tendon. Anchorage hardware shall be
21 clean and free of deleterious substances.

22 23 PLACING OF CONCRETE:

24
25 Do not begin concreting of prestressed members until placement of tendons and conventional
26 reinforcement has been observed and approved by the A/E.

27
28 Place concrete in such a manner as to ensure alignment of post-tensioning tendons and
29 conventional reinforcement remains unchanged.

30
31 Provide uniform compaction of concrete, especially around anchorages.

32 33 STRESSING EQUIPMENT:

34
35 Provide the necessary stressing equipment with certified calibration within 3 months of first
36 use and at maximum 3-month intervals.

37
38 In order to insure proper calibration is maintained, exercise care in handling of stressing
39 equipment.

40 41 PRESTRESSING:

42
43 Concrete Strength: Do not begin tensioning operation until test of field cured concrete
44 cylinders indicate the concrete in the members has attained a compressive strength of not less
45 than 75 percent of the 28 days strength, or as otherwise shown on the drawings.

Subcontractor shall be responsible for testing field-cured cylinders to verify strength for stressing as specified under concrete work.

Stressing Schedule: Concrete mix designs shall be proportioned and construction schedule established so the stressing operation occurs not longer than 10 days after concrete placement.

Stressing Operation: After tests indicate the concrete has reached sufficient strength, stress the tendons by means of hydraulic jacks equipped with calibrated pressure gages with an accuracy of 1 percent of the scale range to allow the stress in the prestressing steel to be computed at any time. Notify the Contractor's Representative 48 hours before any stressing operation takes place.

Minimum anchorage strength and age of post-tensioned concrete member shall be 3,000 psi and 40 hours old, unless otherwise approved by the Contractor.

Conduct the stressing operation as recommended by the manufacturer of the prestressing materials, in the presence of the Contractor's Representative and in compliance with approved shop drawings.

Keep records of the elongation and of the tension applied to each tendon and submit to the Contractor promptly upon the completion of the post-tensioning of each member. At the time of stressing the first member of each type, check the stresses in the individual tendons to establish a post-tensioning procedure to insure uniform results.

Anchoring: Anchor the prestressing steel at an initial or "Transfer Stress" that will result in the retention of working forces or stresses of not less than those shown on the drawings as the final prestress force after losses. In no case shall the steel be anchored at stresses above 94 percent of the specified yield strength of the tendon.

Cutting of Tendon Tails: Do not begin cutting of stressed tendon tails until receipt of written approval of elongation reports by Contractor.

TREATMENT OF ANCHORAGES:

Upon completion of the stressing operation:

1. Coat stressing assemblies with an approved rust preventive material.
2. Apply epoxy bonding agent as specified in Section 03300, Cast-In-Place Concrete.
3. Fill pockets for stressing terminals with grout as follows:
 - a. Exterior and interior exposure in service: Non-shrink, nonmetallic grout.
 - b. Match color and texture of adjacent concrete where exposed to view in completed structure.

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1 PATCHING:
2

3 Thoroughly clean holes left by tie rods, strand hold-down devices, or other temporary inserts.
4 Repair same as required for anchorages.
5

6 Members with honeycomb in areas of such depth as to expose tendons will be examined by
7 Contractor's Representative for structural adequacy. Where impairment of structural
8 adequacy is apparent, the member or work will be rejected.
9

10 When honeycomb areas are to be repaired, remove loose material and cut back area until the
11 coarse aggregate will break under chipping. Saturate the area, allow to approach a condition
12 of surface dryness. Then apply a thin coat of epoxy adhesive bonding agent as specified in
13 Section 03300, Cast-In-Place Concrete and repair with non-metallic, nonshrink grout and
14 cure as required. The method to be used shall meet the approval of the Contractor.
15

16 FIELD QUALITY CONTROL:
17

18 Elongation Reports: Independent testing laboratory or inspector accepted by the Contractor
19 shall oversee elongation measurements and report each in compliance with established
20 procedures.
21

22 Surveillance will be performed by Contractor's Representative to verify compliance of the
23 work to the drawings and specifications.
24

25 END OF SECTION 03365

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SECTION 03400--PRECAST CONCRETE

PART 1--GENERAL

SUMMARY:

The Subcontractor shall provide all plant, labor, and materials required to construct and install precast concrete complete with accessories, reinforcing, grout, prestressing, as required by the drawings and these specifications.

Work includes, but is not limited to:

Furnishing and installing precast concrete for:

- A secondary containment vault for lift station
- An oil water separator
- Electrical and communication manholes
- Sanitary manholes

Related Sections:

03300 Cast In Place Concrete

REFERENCES:

The following documents, including others referenced therein, form part of this Section to the extent designated herein.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 301	Specifications for Structural Concrete for Buildings
ACI 318	Building Code Requirements for Reinforced Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C990	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM A36	Standard Specification for Carbon Structural Steel
ASTM A48	Standard Specification for Gray Iron Casting (R 1990)
ASTM A185	Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A416	Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
ASTM A421	Standard Specification for Uncoated Stress-Relieved Steel Wire for Prestressed Concrete (AASHTO No. M204)

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1 ASTM A615 Standard Specification for Deformed and Plain Billet-Steel
2 Bars for Concrete Reinforcement (AASHTO No. M31)
3
4 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION
5 OFFICIALS (AASHTO)
6
7 AASHTO Standard Specification for Highway Bridges
8
9 AMERICAN WELDING SOCIETY (AWS)
10
11 AWS D1.1 Standard Qualification Procedure
12

13 **SUBMITTALS:**

14
15 Submittals include, but are not limited to the following:

16
17 **Shop Drawings:** Submit drawings for approval indicating fabrication and erection
18 requirements. Show details of joints, reinforcements, inserts, and lifting devices.
19

20 **Welder Qualifications:** Submit welder qualifications.
21

22 **Test Record:** Submit test records.
23

24 See Section 01300, Submittals and the Vendor Data Schedule for additional submittal
25 requirements.
26

27 **QUALITY CONTROL:**

28
29 **Qualifications of Workmen:** Precast shall be regularly engaged in the manufacture and
30 erection of precast concrete products, having a recognized background in such work.
31

32 Qualify welding processes and welding operators in accordance with AWS D1.1 "Standard
33 Qualification Procedure".
34

35 **Codes and Standards:** Comply with provisions of ACI 301 unless otherwise specified herein.
36

37 **Testing:** Perform design mix test and field tests in accordance with Section 03300, Cast In
38 Place Concrete, except that not less than 2 production sets of strength tests will be taken from
39 separate pours.
40

41 **Inspection:** Factory inspection of precast concrete structures shall be arranged for by the
42 Contractor at no cost to the Subcontractor. However, this shall not relieve the Subcontractor
43 from responsibility for compliance with specifications and accuracy of the work in all details.
44 The Subcontractor shall notify the Contractor 3 workdays prior to casting concrete.
45
46

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1 STORAGE AND HANDLING:

2
3 Follow recommendations of ACI 318 for precast concrete.

4
5 Lift only at designated lifting and support points by approved devices.

6
7 Protect edges from spalling, chipping, or cracking with suitable padding or wrapping.

8
9 PART 2--PRODUCTS

10
11 FORM MATERIALS:

12
13 Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for
14 exposed concrete surfaces with plywood, metal, or metal-framed plywood faced to provide
15 continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to
16 minimize number of joints. Provide form material with sufficient thickness to withstand
17 pressure of newly-placed concrete without visible bow or deflection.

18
19 Plywood shall comply with American Plywood Association, grade "EXT-DFPA Plyform" or
20 better.

21
22 Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in
23 finished structure with plywood, lumber, or metal.

24
25 Form Coatings: Provide commercial formulation form-coating compounds that will not bond
26 with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments
27 of concrete surfaces.

28
29 REINFORCING MATERIALS:

30
31 Reinforcing Bars: ASTM A615 Grade 60 deformed; Grade 40 may be used for No. 4 and
32 smaller ties.

33
34 Welded Wire Fabric (WWF): ASTM A185, welded steel wire fabric.

35
36 Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs,
37 spacers and other devices for spacing, supporting and fastening reinforcing in place. Use
38 wire bar type supports complying with CRSI recommendations, unless otherwise indicated.
39 Use supports with sand plates or horizontal runners where base material will not support
40 chair legs. Pumice blocks are not acceptable for rebar or wire mesh supports.

41
42 Plates: Embedded plates shall be ASTM A36.

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Concrete Mix: Comply with applicable requirements of Section 03300 for following concrete class:

Cement:	Type II
Class 40:	4,000 psi 28-day compressive strength
Slump:	3 in. \pm 1 in.

METAL ACCESSORIES:

Frames and Covers: Grey cast iron, ASTM A48, Class 30. Capable of withstanding AASHTO H20 truck traffic. There are 3 places where watertight seals and locknuts are required on the metal manhole covers. See plans for locations. The Subcontractor shall furnish a wrench to open the manhole covers to the Contractor.

Vault Steps: Grey cast iron, ASTM A48, Class 30B, integrally cast into manhole sidewalls, unless otherwise indicated.

Joint Sealants: Comply with ASTM C990, Preformed Flexible Joint Sealants.

DESIGN CRITERIA:

General: All precast concrete shall be designed in accordance with ACI 318.

Loads: Precast structures shall be capable of supporting an AASHTO H20 truck axle load. All precast items shall be capable of withstanding all lifting and handling loads.

FABRICATION:

General: Maintain formwork to provide complete precast concrete of the shape, lines, and dimensions indicated. Provide and install chamfer strips on exterior edges.

Casting Tolerances:

Length \pm 1/2 in.
Width \pm 1/4 in.
Depth \pm 1/4 in.
Position of handling devices \pm 2 in.
Position of embedded angles to be welded between adjoining panels \pm 1 in. longitudinally.
Deflection 1/8 in per 10 ft, but not greater than 1/2 in. between adjoining panels.
Squareness of Ends (vertical and horizontal alignment) \pm 1/4 in.

Finishing: Fabricate with a smooth form finish. See Section 03300.

Curing: Comply with applicable requirements of Section 03300.

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Lifting: Do not lift precast units until concrete has obtained a minimum of 3,500 psi compressive strength (fc') as determined by test cylinders cast on the same day. If design requires a higher compressive strength before lifting the higher strength shall apply.

PART 3--EXECUTION

INSPECTION:

Before installing, verify conditions are adequate to receive precast units. Required corrections to be made before proceeding with placement.

Determine field conditions by actual measurements. Double check and cross check measurements.

All precast structures shall be inspected prior to placement for damage or casting deviations in excess of tolerances specified.

ERECTION:

Employ only competent personnel who are properly trained to prepare, handle, and install precast concrete.

Method of installation shall avoid soiling, cracking, chipping of concrete, and damage to built-in items.

Apply joint sealant material at joints of sections.

FIELD QUALITY CONTROL

Surveillance will be performed by Contractor's Representative to verify compliance of the work to the drawings and specifications.

END OF SECTION 03400

SECTION 03410--PRECAST/PRESTRESSED CONCRETE

PART 1--GENERAL

SUMMARY:

Work includes, but is not limited to:

Design, manufacture, transportation and installation, as required, of the precast/prestressed portions of the structure as shown on the drawings and specified herein.

The ceiling deck shall be constructed of precast/prestressed concrete panels as shown on the subcontract drawings. The panels shall be supplied by a company regularly engaged in the manufacture of precast, prestressed concrete members, having a recognized background in such work and experience in the use of a well-recognized prestressing system. Design and construction of the members shall be such that the member's will meet the specified loads and conditions.

Related Sections:

03300 Cast In Place Concrete
05100 Structural Steel and Miscellaneous Metals

REFERENCES:

The following documents, including others referenced therein, form part of this Section to the extent designated herein.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 416 Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete

ASTM A 421 Standard Specification for Uncoated Stress-Relieved Steel Wire for Prestressed Concrete (AASHTO M204)

ASTM A 615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement (AASHTO M31)

ASTM C 94 Standard Specification for Portland Cement

AMERICAN CONCRETE INSTITUTE (ACI)

ACI-301 Specifications for Structural Concrete for Buildings

ACI-318 Building Code Requirements for Reinforced Concrete

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AMERICAN SOCIETY OF CIVIL ENGINEERS

ASCE 7-98 Minimum Design Loads for Buildings and Other Structures

INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

UBC Uniform Building Code

SYSTEM DESCRIPTION:

Design Requirements:

General: All precast/prestressed concrete shall be designed in accordance with ACI 318.

Loads: The panels shall be designed for the following minimum loads:

Hollow Core Ceiling Panel Dead Load: Weight of structural member plus 2-in. normal weight concrete topping, as shown on the drawings.

Ceiling Panel Live Load: 125 psf.

Deflections: Deflection shall be limited to $L/360$ at any span center under most severe vertical load combination.

SUBMITTALS:

Submittals include, but are not limited to the following:

Design Calculations: Submit completed and checked detail design calculations substantiating the design of the precast/prestressed concrete roof panel members and their connections to shear walls and structural steel. A professional engineer registered in the State of Idaho shall stamp and sign calculations.

Shop Drawings: Provide drawings indicating fabrication and erection requirements. Show details of joints, reinforcements, shear connectors, inserts and lifting devices. A professional engineer registered in the State of Idaho shall stamp and sign calculations.

Mix Design: Submit mix design.

See Section 01300, Submittals and the Vendor Data Schedule for additional submittal requirements.

QUALITY CONTROL:

The precast concrete panels shall be supplied by a company regularly engaged in the manufacture of precast, prestressed concrete panels, having a recognized background in such

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work and which is experienced in the use of a well-recognized prestressing system. Design and construction of the panels shall be such that the members will meet the specified loads and conditions.

DELIVERY, STORAGE AND HANDLING:

Follow recommendations of ACI 318 for precast concrete.

Lift panels only at designated lifting and supporting points by approved devices.

Protect edges from spalling, chipping or cracking with suitable padding or wrapping if left exposed.

PART 2--PRODUCTS

MATERIALS:

Formwork and Accessories: Comply with applicable requirements of Section 03300, "Cast in Place Concrete".

Reinforcements and Inserts: Comply with applicable requirements of Section 03300, "Cast in Place Concrete". Embedded plates shall be ASTM A 36.

Prestressing: Comply with ASTM A 416 and/or ASTM A 421.

Concrete Mix: Comply with applicable requirements of Section 03300, "Cast in Place Concrete" for following concrete class:

Cement:	Type II
fc:	5,000 psi
Slump:	3 in. \pm 1 in.
Air Entrainment:	0%
Max. Aggregate Size:	$\frac{3}{4}$ in.
Admixtures:	Water reducing—No other admixtures permitted

Nonshrink Grout:

L&M Construction Chemicals—"Crystex"
Meadows—"V-1"
Master Builders—"Masterflow 923"

Lifting Inserts: (Alternate) Burke Coil, loop, or screw anchor, with a safety factor of 4, in accordance with ACI 318.

FABRICATION:

General: Maintain formwork to provide complete precast concrete panels of the shape, lines and dimensions indicated.

Casting Tolerances:

Length $\pm \frac{1}{2}$ in.

Width $\pm \frac{1}{4}$ in.

Depth $\pm \frac{1}{4}$ in.

Position of handling devices ± 2 in.

Position of embedded connectors and other embedded items to be welded between adjoining panels ± 1 in. longitudinally.

Deflection $\frac{1}{8}$ in. per 10 ft., but not greater than $\frac{1}{2}$ in. between adjoining panels.

Squareness of Ends (vertical and horizontal alignment) $\pm \frac{1}{4}$ in.

Finish: Material furnished shall be standard structural concrete with normal surface color and texture variations. Small surface holes caused by air bubbles normal form joint marks and minor chips and spalls will be permitted, but no major or unsightly imperfections, honeycomb, or structural defects will be permitted. Unformed surfaces that receive topping shall have a scratch finish. Surfaces to be visible in the finished structure shall have a smooth finish.

Curing: Provide only by moisture curing method. No compounds will be acceptable.

Lifting: Do not lift precast units until concrete has obtained a minimum of 3,500 psi compressive strength (f_c') as determined by test cylinders cast on the same day. If design requires a higher strength before lifting, it shall apply.

PART 3--EXECUTION

INSPECTION:

Prior to fabrication, determine field conditions by actual measurements. Double check and cross check measurements.

Before erection, verify supports and anchorage is adequate to receive precast units. Required corrections to be made before proceeding with placement.

All panels shall be inspected prior to placement for irreparable damage or casting deviations in excess of tolerances specified.

1 ERECTION:

2
3 Employ only competent workmen who are properly trained to prepare, handle and erect
4 precast concrete panels.

5
6 Method of erection should be such as to avoid soiling, cracking, chipping of panels and
7 damage to built-in items.

8
9 Each precast unit shall be aligned accurately to achieve the joint detail spacing shown on
10 drawings.

11
12 Panels may be shimmed (in addition to shoring) during initial tackwelding to accommodate
13 full weld penetration. Provide welded connections in accordance with the drawings.
14 Remove all loose slag and debris immediately after welding is complete.

15
16 GROUTING:

17
18 Provide high-pressure water supply to flush dirt and foreign substances from joints.

19
20 Mix grout and prepare joints in accordance with manufacturer's recommendations.

21
22 Provide temporary, nonstaining, backer material in joint to prevent grout migration at ends of
23 panels and base of joint.

24
25 Install grout by manufacturer's approved methods in accordance with approved drawings.

26
27 CONCRETE TOPPING:

28
29 Topping shall be installed in accordance with requirements in Section 03300.

30
31 FIELD QUALITY CONTROL:

32
33 Contractor Inspection: Surveillance will be performed by Contractor's Representative to
34 verify compliance of the work to the drawings and specifications.

35
36 Contractor Supplied Testing:

37
38 Inspection: The Contractor at no cost to the Subcontractor will arrange for Factory
39 inspection of Precast Concrete Panels. However, this shall not relieve the Subcontractor
40 from responsibility for compliance with specifications and accuracy of the work in all details.

41
42 Subcontractor Supplied Testing: The Subcontractor or his agents shall perform the following
43 tests:

44
45 Perform design mix test and field tests in accordance with Section 03300, except that not
46 less than 2 production sets of strength tests will be taken from separate placements.

Project Title: Staging, Storage, Sizing and Treatment Facility
Document Type: Construction Specifications **Project Number:** 020996
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1 END OF SECTION 03410